The
Electrical Review

VOL. CXXII FEBRUARY 11, 1938 No. 3142

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, SEDIST, LONDON." Code, A B C. Telephone No.: Waterloo 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

Classified Advertisements—Official Notices—Tenders—Supp. 19.

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Peaks and Plateaux

METHODS of operating power stations have evolved on the basis of a "lighting peak," which is in reality due to the overlapping of the lighting and power loads during the middle of the winter. As a relatively high price is obtainable for electricity supplied for lighting the cost of additional plant needed for the short-peak periods has not hitherto been a very serious factor.

Latterly, concern has been expressed in some quarters lest the cooking and heating loads should build up peaks of their own that would be higher than lighting-plus-power levels, thereby involving a risk that the low rates essential for domestic development might become uneconomic.

There is abundant evidence that a high diversity exists between domestic and power loads, and that this has actually tended to increase the over-all load factor. Will this tendency continue? It seems inherently improbable that this will be so.

At present peaks are met by running older plant, the higher fuel consumption of which is unimportant compared with the consideration that no new capital expenditure is entailed by its use. Within the next few years, however, the kind of peaks to be anticipated will require larger and more quickly started units than those now available as spare. They will be experienced in summer as well as in winter and at week-ends also. Moreover, they will last longer. In other words, the peak will become more nearly a "plateau" that must be catered for all the year round.

Because the high-load periods are longer, efficiency during such times will become more important. But efficiency will also be essential for another reason: that is to keep the physical dimensions of the plant within practicable limits. This implies the use of steam at high pressures and temperatures.

How is all this likely to affect plans for generation a decade hence? The question is by no means an academic one, as it takes more than two years to carry out a major extension at a capital station and four years to build a new one, and in the meantime the load curve is changing its contour.

A study of the problems of power station design affected by load developments made by Mr. D. H. Parry (chairman, East Midland Sub-Centre) and reproduced in the last I.E.E. *Journal* goes to the root of the matter. In this he works out, among other proposals, a modification of the unit principle of one boiler and one turbine (as would be applied to base loads) for the purpose of dealing with the superimposed demands due to increased domestic load.

One of the pleasing features of Mr. Parry's views is that they are in line with present engineering developments. It was not within the scope of his remarks to deal with the question of how far the alteration in the load curve and the methods of generation devised to meet it will enable the peak to be met at a cost that will justify low domestic charges.

No doubt, the offering of low secondary rates would flatten the load curve still further, thus reducing costs with increasing load factor. This aspect may be commended as offering a profitable field for inquiry.

BRITISH INDUSTRIES FAIR

Next week's issue of

THE ELECTRICAL REVIEW

will contain a fully illustrated guide to the electrical exhibits in London and Birmingham.

The Boiling Plate

TESTS on several kinds of hot-plates are reported in this issue which, taken in conjunction with the recent discussion on electric cooking at the I.E.E., indicate that there is still plenty of room for differences of opinion as to which is the more generally suitable. For one type a higher thermal efficiency may be claimed, but this excellent technical feature may be more than offset by a longer time taken in bringing liquid to the boil if the whole value of energy used in warming half a pint is no more than the cost of a match. The importance of speed seems to vary inversely with the quantity heated. There are, however, other factors besides rapid operation and energy consumption, since first cost, reliability, maintenance and convenience have also to be taken into account. A prime consideration when assessing the advantages of one type in any particular instance is not so much the appeal of its more obvious advantages as the probability of its giving permanent satisfaction.

Developments at Oxford

THE decision of the ordinary shareholders of the Oxford Electric Co. to accept the offer of the Wessex Electricity Co. for the undertaking is not to be the last word on the subject. The Oxford City Council has decided to continue its efforts to acquire the business. To this end it proposes to promote a Parliamentary Bill and in the meantime take steps to prevent the handing over of the undertaking. In the discussion upon the matter the Electricity Commissioners were criticised by the chairman of the Electricity Committee for not informing the Council before January 11th that they had given their approval to the transfer of the undertaking to the Wessex Co. and for refusing to receive a deputation from the Corporation. Another speaker stated that other adjacent areas were anxious to obtain their electricity from the Corporation. The *Financial Times* states that the Oxford Company's ordinary shares, which changed hands at 28s. 9d. in November last, are now quoted at 37s. 6d.

Applying for a Job

THE article on "Applying for an Appointment," which we print in this issue, will interest many of our readers who regularly study our "Situations Vacant" columns, especially the younger men. The author's pen-name conceals the identity of a well-known supply engineer, and so his advice is worth following. He utters a warning regarding too much "window-dressing" in applications for jobs. No doubt a candidate wants to make out the best case for himself, but he must remember that his statements are easily checked, and over-estimation of his own abilities will not help him to secure the position. Contrary to a somewhat prevalent idea that most vacancies are already filled before they are advertised, the majority of advertisers are anxious to secure the best men for their vacancies, and in the preliminary stage they can only judge of a man's suitability by his application letter. It is thus the first step which counts.

Re-sale of Electricity

AT a time when so much attention is being paid to the question of the desirability of arriving at some measure of standardisation of charges for electricity, it is disturbing to find that in certain directions efforts at standardisation are being actively frustrated. Tenants of some flats, particularly those in large blocks, are becoming aware that in many cases they are paying a totally different rate for electricity from those who may occupy private houses in the same area of supply. Although each flat has its own meter recording the amount of electricity used by the tenant, payment for the electricity used is made to the landlord of the block of flats, often at a rate very different from that which the landlord pays to the electricity suppliers. The landlord is, in fact, buying in bulk and retailing to tenants, presumably at as high a rate as he can safely charge without stirring his tenants into revolt. The landlord is presumably entitled to make these higher charges, but the system is one which can scarcely be regarded as satisfactory to those who are interested in encouraging the extended use of electricity for domestic purposes, and it is a system which, with the present rate of increase in the flat-living tendency, is likely to become serious if no stand is taken by tenants against the practice.

Voltage Regulation

WHILE there is nothing like having plenty of copper in the mains in the first instance to ensure a steady voltage at the receiving end, there comes a time when the running of a new feeder or the putting down of an additional sub-station is found necessary to secure satisfactory operating conditions. Probably, however, revenue will have been steadily lost for some time before this happens owing to under-voltage at times of greatest demand. On the other hand, expenditure on strengthening the network may not become remunerative for a long period ahead. The day of reckoning may, however, be staved off by the use of various types of voltage regulating devices. Of these, the moving-coil voltage regulator, described by Mr. E. T. Norris in his I.E.E. paper, has been known long enough for it to be regarded as an established means to this end. The discussion showed that engineers who have had it in use on their systems for several years attach special importance to the negligible amount of maintenance it has involved. Taking satisfaction to the consumer and revenue to the undertaking together, the field for such apparatus should materially increase.

Plug Chaos

THE question of plug and socket variety was raised with some force by Mr. Frank Forrest at the recent dinner of the Birmingham branch of the Electrical Contractors' Association. He said that upon moving into a new bungalow he found that none of the plugs was of a standard type. He did not on this account abandon electricity, but this might easily be the case with a non-electrical man faced with the same difficulty. Suppliers of appliances often "get over" the difficulty by not supplying plugs at all, knowing that the chances are that they won't fit the socket to which they will be applied. One evil arising from this is the attachment of appliances to lampholders, for they at least are standardised. Is it not about time that adherence to definite standards was required?

Slower Progress

THE January returns rendered to the Electricity Commissioners showed that the generation of electricity during the month was only 9.5 per cent. above the January, 1937, figure. For the whole of last year the increase was 13.3 per cent. A number of adverse factors operated during the month. In the first place the heating consumption must have been lower on account of the unusually mild weather. Then the industrial situation, as revealed by the unemployment figures, was not very satisfactory. And is it not possible that the prolonged delay of the Government to reveal its intentions with regard to electricity distribution has had an adverse effect?

Ethereal Light

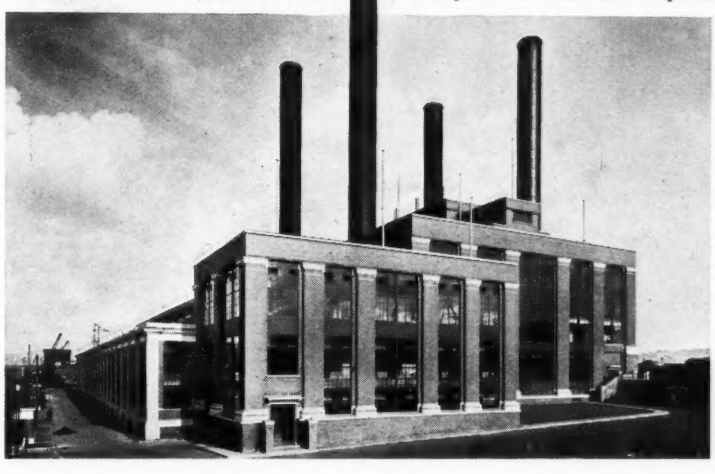
FOUR hundred Hamburg market gardeners are reported to have been fined 10 marks each for stealing energy radiated from the city's broadcasting station. As the total reward of their efforts was only 5 kW (*i.e.*, about 12 W each), the game was hardly worth the candle or so of lighting which they obtained. But can we be sure that it was only the Hamburg station which provided the criminals with their inadequate illumination? If their receiving arrangements were not sharply tuned they may also have been helping themselves to power from Hamburg's neighbours in the medium waveband—London Regional and Radio-Toulouse, and thus the matter may be of international significance.

Load Building in Yorkshire—I.

The outlook and activities of the Yorkshire Electric Power Co.

SO diversified are the industries of Yorkshire that it is almost impossible to talk of the influence of any one or group of industries or of any one class of load on the supply undertaking. The influence of industry generally, however, is clearly marked, for throughout the whole area of 2,700 square miles, over 400 million kWh was supplied by the Yorkshire Electric Power Co. last year. 179 million kWh was supplied in bulk to various authorised undertakers within the area and of this quantity a good deal was used for domestic purposes. A number of the bulk-supply authorities leave the Power Company to deal direct with the power users.

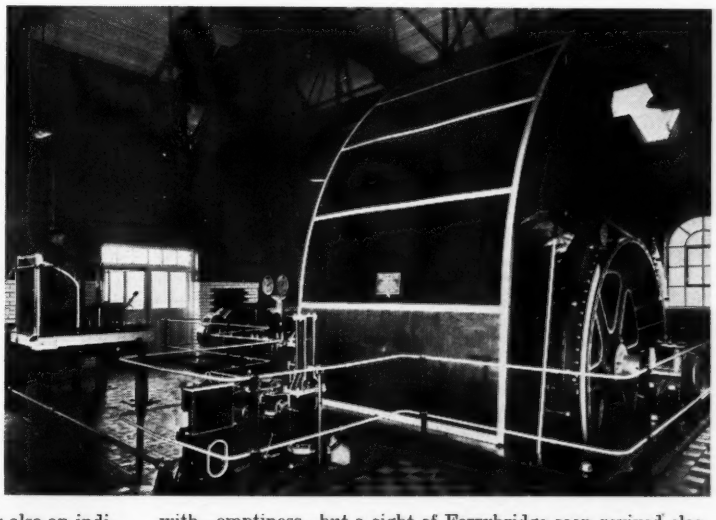
The remainder of the 400 million kWh was sold to large power consumers. Apart from the relative importance with regard to the sizes of the many and varied industries, generally no special effort is made in any one direction towards load building.



The recently extended Thornhill power station

The fundamental power load building work of the undertaking is a study of the consumers' problems, a study so close that it often means an actual scientific research from which the consumer benefits in matters peculiar to his own production. Such a close study can only be effected by specially qualified engineers, so that the sales organisation provides assistants who, under the sales engineer, deal with one or two major industries. For instance, one assistant deals mainly with bulk supplies, another with collieries, another with textile industries, and another with pumping and brickworks. All sizeable load is canvassed for and negotiated direct from the headquarters office at Leeds. Business contacts are made by keeping an eye on building operations, and the local papers are searched every day for possible contacts. Notification of a water supply, for instance, is followed up, and although the seed thus sown may not germinate for years, the business is ensured. We are sure that the enthusiasm behind the remark of an assistant, "I revel in getting a job against the oil engine," is the right load-building spirit, and the force behind the assertion that the man who can sell power is the man who has been through the works is convincing.

The undertaking keeps a record of every power user and has notes of the plant he has got; thus the load builder is in a good position to discuss matters closely concerning the prospective consumer. As a result inquiries are usually received from these people when they lack power by reason of business growth or deterioration of private plant. Each record details the plant installed, its condition, age, and probable life, and yearly discussions are arranged with the principals of the firms so as to keep the records up to date. When the user becomes a consumer the card is changed in colour and the record continued. The card carries an ordnance map number and also a number on the map so that the consumer's location can be immediately ascertained. There is also an indication of whether the user is within reasonable distance from the mains. This record is found in a file of districts and also in a file of trades. Each industry carries a number which is also on the district card. In each trade book non-consumers and consumers are recorded separately and the whole is summarised on the front page. On maps of varying scale, according to the detail shown, the whole area is divided into squares showing the distribution of load. On 6-in. maps the position of every mine and factory in the area is shown.



A 700-h.p. 2,000-V electric winder at North Gawber Collieries

The special sales research work undertaken in connection with the collieries is resulting in a growing tendency for the coal industry to look upon electricity supply as a distributor of coal in another form rather than as a competitor. The supply industry burns 13 million tons of coal a year. This change of outlook is certainly helping co-operation, and one example is the aid given to the collieries to get rid of their low-grade coal.

Perhaps the result of this co-operation of the greatest value, however, is the realisation which was brought about in a really wide sense during the depression years that the only chance the coal industry has is to improve its efficiency and that the future depends on mechanisation, which means higher wages and cheaper coal. The great advantage the electrical man has in being able to measure almost anything with accuracy means that the supply company can tell the colliery just what his load is and will be—electrical and non-electrical—and make valuable corrections to the colliery's own estimates. It is not uncommon to discover that a colliery's estimate of its own electricity consumption is just double the actual quantity.

The very low efficiency of the steam winder led collieries to install exhaust turbines, from which some thought they were getting electricity for nothing. Persuasion by the power company that this was an expedient led to a fuller use of the electric winder, which has become definitely established.

A tour of 100 miles or so in the district immediately S.E. and S. of Leeds was particularly encouraging by way of contrast with what we saw in and about the collieries a few years ago, for in spite of an early observation at Garforth, where the collieries have been shut down as a result of the concentration, extensions and modernisation are the order of the day everywhere. At the bacon factory at Sherburn some hundreds of pigs per week are "electrocuted" (stunning process) as they walk into the factory. The next few miles revealed something of what the rural distribution engineer has to contend with—emptiness—but a sight of Ferrybridge soon revived electrical interest. There is the paraphernalia associated with the construction of turbine and boiler foundations. Two 45,000-kW sets are to go in, and they will treble the plant capacity.

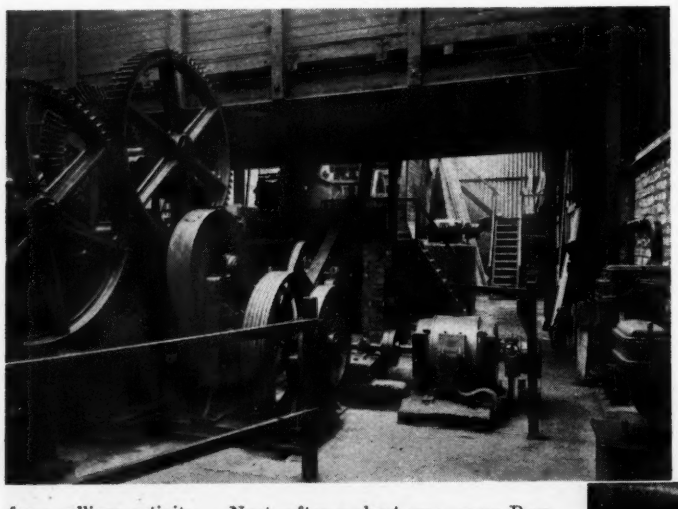
Grinding is the principal load-building process in a new bone-manure factory (100 kVA) near Ferrybridge. At Pontefract, of liquorice fame, other industries, including the maltsters and the racecourse, add usefully to load diversity. The Castleford district, with its Allerton Bywater, Wheldale and Fryston collieries, is a veritable hive of industry. The three pits demand 1,500 kVA and consume 3 to 4 million kWh per

year. They have their own generating plant and run in parallel with the Y.E.P., using the power company's lines for colliery interchange of privately generated energy when required.

Fryston seemed to be the last word in surface cleanliness and orderliness. From the pits the miners walk along a covered-in gantry to the baths and changing rooms. Castleford colliery housing estate is a real "eye-opener" which, with its wide streets, modern semi-detached houses, shops and church, all progressively using electricity, challenges a good many estates connected with the large cities and towns. At Upton we saw a colliery which, it is hoped, will shortly "come on." The colliery company once distributed electricity in the village, but the Y.E.P. has now taken the scheme over.

The entrance hall of the Y.E.P. headquarters, Leeds

The high ground just before Elmsall revealed in the valley on the right the cluster of villages in the neighbourhood of the South Kirkby and Frickley collieries, all well served electrically and obviously busy. Mellowed and well-preserved sixteenth-century houses in historic Hooton Pagnell and Lord Halifax's Hall and deer park at Hickleton are both so near and so far from colliery activity. Next, after a short run, came Barnborough and then Goldthorpe collieries, both with public supplies; but just to remind our guide, Mr. Gaunt, of work ahead we immediately saw the Hickleton collieries with their all-private generation and their own ring-main distribution system.



They are opening out a new seam at Barnborough and have just installed skip winding. Instead of the usual 4 to 6 half-ton tubs in the cage the skip is a direct container for 8 tons. The larger weight and lower speed employs the h.p. more usefully. Coke-oven and washery plants are installed at Manvers Main, and Wath village has become further activated by the ingress of the glass industry. This district is served by the Dearne District Electricity Board—a bulk supply undertaking. A Dearne Valley Water Board development is particularly interesting. Beside the long steam pumping station is its successor—the electric station, a quarter the size and housing both the pumps and the 400-kVA sub-station plant.

At Wombwell a brickworks demands 150 kVA, and at Darfield Main colliery the supply company has just made available a 500-kVA supply mainly to develop a new seam which has been opened up after a lapse of ten years. The shaft (21 ft. diameter and 600 yd. deep) is one of the biggest in Yorkshire. The Y.E.P. has lent the colliery a 300-kW rotary for a d.c. supply in the older workings pending the change-over of the d.c. system. At the adjacent Mitchell Main colliery new coke ovens and by-product plant are being installed and will be served by a new 500-kVA supply. Of the 750-kVA supply to the colliery proper 250 kVA is for continuous pumping.

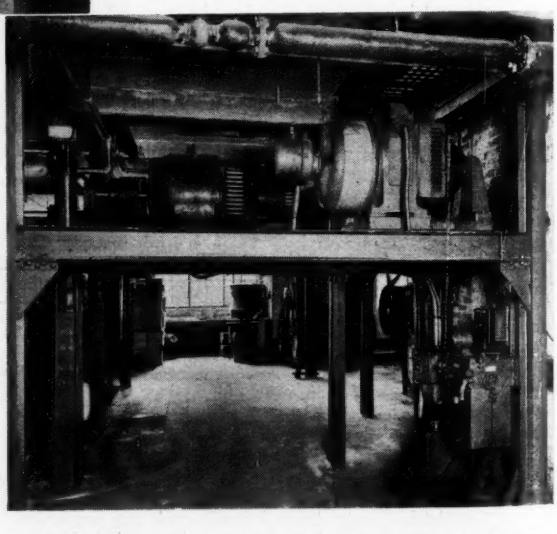
A "grade A" milk farm, with its electrically driven milking and hay-drying machines; the Yorkshire brick works with a 400-kVA supply for clay haulage, clay breaking, moulding machines and kiln fans; the chemical trades glassware factory (150 kVA); two pits with 1,000 kVA each; and the several bulk-supply points for the town are of interest in and around Barnsley.

Next came the 14,000-kW Barugh power station, where some of the boiler firing is done by coke-oven gas from the adjacent ovens (800 kVA) of the Old Silkstone collieries. A 150-kVA textile factory for linens in the heart of this intense colliery district was a surprise item. In the distance on the way to Darton we could see the Wooley colliery, which we visited and described fully a few years ago. With its 3,000-kVA supply it is still all-electric and all-public supply, and extensions are going ahead apace with seam development.

The Darton pits (500 kVA); the North Gawber colliery, where the supply is now being duplicated (1,250 kVA), and there is a 700-h.p. winder; the two Wharncliffe Woodmore pits (each 1,000 kVA); the 1,500-kVA New Monckton collieries; and the electrically operated bridge over the canal in Royston, all caught our eye within the next mile or two. At Nostell colliery, of Nostell-Wragby house-coal fame, a 400-kW mercury rectifier runs in parallel with the d.c. private-generation plant and takes back-shift loads alone.

At Shay Lane sub-station the 33-kV Ferrybridge-Crigglestone cable is now looped-in to deal with the Nostell developments and makes possible a supply to Walton and Crofton. At Crigglestone the collieries have decided to develop a.c. underground, and the Y.E.P. has made available 500 kVA. As we approached Bretton, where the dairy farm, sawmill, and so on, on Lord Allendale's estate, street lighting and the smallest cottage are all supplied, we were shown Wooley Edge, where outcrop coal was actually ploughed up during the 1926 strike.

Left: A machine at Kirkheaton producing 40 bricks a minute. Below: Synchronous and "No-lag" motor drives in Troydale woollen mills



Electricity plays its part in "prison reform" at Dial Wood, near Bretton, the new prison camp which is connected with Wakefield jail.

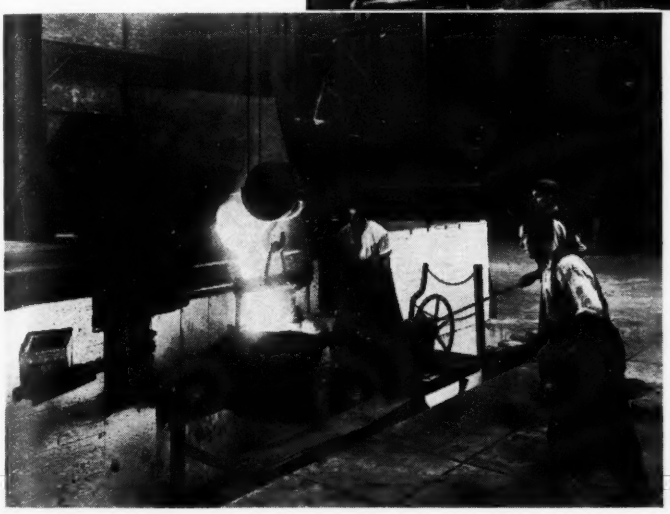
Humps on the side of the Barnsley-Huddersfield road inspired our guide to relate the story of the early bell mining, of

which they are relics. Another bit of early mining history is that machine mining was instituted in 1883 at the Park Mill and Emley Moor collieries, near Clayton West. These collieries decided to go on to the company's mains in 1909.

In turning north we missed a number of important developments in the South Yorkshire coalfields. For instance, in the one group control, 1,000-kVA supplies have just been negotiated for each of the Thorncliffe,

Right: In a clothing factory at Castleford. Below: Steel pouring from a h.f. furnace at Ecclesford steel works

Hoyland, Silkstone and Smithy Wood collieries, and a 2,000-kVA supply for the Thorncliffe ironworks—all just north of Rotherham. Lepton and Overton revealed some of the smaller pits peculiar to the shallow-coal district of West Yorkshire. At the moment the bright red brick of the extension at the west end of Thornhill power station is conspicuous. The new 30,000-kW set brings the station capacity up to 85,000 kW. At Dewsbury, the Y.E.P. headquarters up to 1928, a large block of shops is now nearing completion, and it is easy to pick out which shop will be the new branch supply showroom because of the abnormal amount of wiring.



The heavy textile district of Yorkshire is devoted almost entirely to woollen and worsted goods, and the complete cloth is made from the sheep's back, as it were, for suitings and dress goods. Again, that industrial research which is all part and parcel of salesmanship has resulted in a full knowledge of the correct way to drive a machine. For instance, work on the effect of speed variation on spinning has shown that the smoother electric drive improves not only the quantity but also the quality of the product, and this is one of the load-builder's best arguments. It has been found that where it is possible to increase the spindle speed by 10 per cent. the extra production which results will often cover the cost of electricity for running the whole mill.

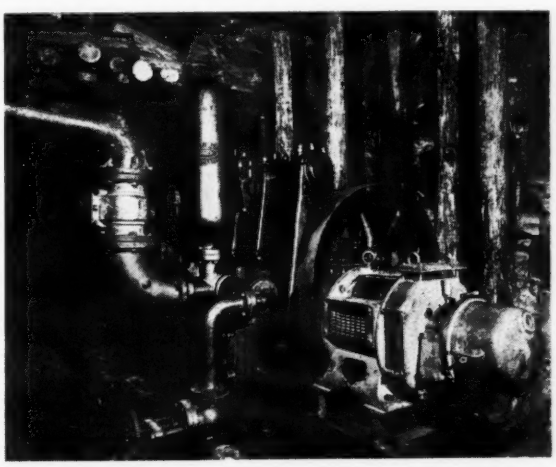
The process steam problem is still a difficult one, but the undertaking has found that rarely do the demands for steam and power coincide, and that in many cases it has paid to separate the demands. Separation of driving has also been found advisable because of the reflection of the variable load of the mule spinning machine on the steadier mill loads.

Perhaps a partial exception to the absence of individual industrial influence is the iron and steel district near Sheffield, where there is a tremendous furnace load. At Stocksbridge, for instance, Samuel Fox & Co., Ltd., utilise about 25 million kWh per year, several h.f. furnaces being largely responsible for this load. The undertaking finds that steelworks are depending more and more on public supply because of the efforts to control waste heat. The coke consumed for the production of pig iron has been reduced by about 25 per cent. The heat is also being used more and more for heat-treatment work in preference to the production of power, so opening the door wider for public supply. Sir Robert Hadfield's work in connection with the finer steels has resulted in many important developments for the electrical industry. Transformer losses are now less than one-third of what they were, and Mr. Woodhouse confidently expects that new steels now being developed will have important repercussions of great economical value to the supply industry in permitting the use of individual transformers for farmers and other consumers in rural areas.

The consumption of the Yorkshire Copper Works, Ltd., at Stourton, is 13,000,000 kWh a year. The supply is transmitted through the works by the consumer's own e.h.p. ring main, and sub-stations are established at various points for distribution throughout the works.

David Brown & Sons have recently opened a new factory at Penistone, where for heating and power they demand about 1,200 kVA. This development has revived the industry of the town which has been depressed for some years; 400 people are now employed.

Load development in the house-building trades is also showing excellent results, again largely by the co-operation between the undertaking and consumers. One large cement works on the system is believed to have the lowest production costs in the country. Brickfields are scattered over the whole area, and 85 per cent. of them are on public supply. When the houses are built the undertaking helps the builder to sell them by floodlighting them.



45-h.p. 400-V drive for three-throw ram pump in a North Crawber colliery

We must leave further notes on development, particularly those in the domestic sphere, for a further article.

Hair Dryers at Public Baths

Two electric hair dryers were recently installed at the public baths at Accrington, and within the first fortnight they were used by 500 people. A number of inquiries have been received from other towns.

Engineering Report Writing. By A. G. H. Luff

The need for clarity and conciseness

MOST engineers are called upon, at some time or another, to submit reports. The demand is often made suddenly, and a junior engineer may experience a little difficulty in setting down in a neat and methodical manner the conclusions and recommendations produced by his investigations. The following remarks are set forth in the hope that they will be helpful to assistant engineers.

It must be appreciated that reports, with the exception of routine, are invariably read by some executive official—a chief engineer, manager or someone with a like status, and a well-written account of an examination can create the impression that the surveyor is a man of parts, that he is well versed in his profession, and that he is not afraid of making a definite decision.

A report should always contain recommendations. For example, if one was called upon to survey a factory installation and discovered a motor in a faulty condition, it would be useless merely to report that motor as unsafe or unfit for duty. There would have to be a recommendation that the machine be withdrawn from service, or the fault clearly defined and the steps necessary to repair the fault definitely stated. Even if the whole installation was satisfactory the inspector should report that any alteration was unnecessary.

The author stresses the necessity for those preparing reports to make definite recommendations

There is also the negative aspect to be considered. An executive presented with a well-written document may not appreciate the comprehensiveness and conciseness of the writing. But there is little doubt that, presented with a report that is badly formulated, or contains ambiguities, it is a thousand to one that he will notice the errors.

Types of Report

A few of the possible subjects upon which an electrical engineer may be required to submit a report are routine matters, the breakdown of a machine, general survey of an installation to investigate the possibility of an increase in efficiency, survey to collect specifications for new plant, and the safety of an installation. The list could be continued almost indefinitely.

The point that it is intended to emphasise is the need for keeping within the intended scope of the investigation. Carefully study the object of the report and write nothing irrelevant to that object; do not drag in unnecessary details.

One may be commissioned to make a comprehensive survey of an extensive installation with a view to increasing its efficiency. In that case practically all electrical items would be included and commented upon. But if one has to examine a machine for safety—that is, to see that it is installed in a position and manner that is not dangerous to human life, recommendations may be made regarding earthing or properly fencing the machine, but not concerning the efficiency or suitability of machine for work.

In actual practice the surveyor will receive his instructions to make a report, and will be aware of the purpose for which the report is required. He must then use his own judgment and see that he submits sufficient details to fulfil that purpose, and omit any matter that is irrelevant. Remember that a digression is inadmissible in a report.

Routine and General Reports

It is not intended to make much mention of routine reports. As a general rule they are not read by an executive, but their value to the maintenance engineer is well known. I therefore suggest that for recording routine examinations some card-index system is of great advantage. The system may be very simple, each card merely containing the number, h.p., and position of a machine, with a small space for the dates of inspections and any recommendations for overhauling or repairs. It is just as cheap, and far more efficient, to do this than keep records in odd note-books.

A report has much in common with an essay in that it should be well arranged, properly proportioned, and be a complete narrative. It should be written in as simple language as is possible. Employ no literary tricks or complex words in a desire to parade erudition, but concentrate on making the meanings of the written statements perfectly clear. Quintilian's admirable words regarding oratory are equally true of reporting. "We must study not only that it shall be possible for every hearer to understand us, but that it shall be impossible for him not to understand us."

The style should aim at brevity, even to the point of terseness. Generally, it will be found preferable to use short sentences, although the context should run smoothly. But brief, concise sentences naturally lend themselves to clear statement better than do long, involved ones.

Ambiguity must be avoided at all cost. Even if one has to sacrifice brevity in order to make an explanation perfectly lucid, it should be done for the sake of clearness.

While on this subject I may be pardoned for making a plea for good grammar and correct syntax. Engineers after leaving college are apt to concentrate on technical subjects and let their English take care of itself. So before a report is submitted let it be scrutinised very carefully for grammatical errors and even errors of spelling. The best of us are capable of making mistakes, and a sentence which may be suitable when used in a conversation in a workshop, may appear decidedly uncouth when read out in a manager's office. Such details are merely a question of care, but it is surprising how often they are overlooked. Each engineer will develop his own system of routine reporting. There are a number of ways of formulating other reports, the two most common of which are:—

1. Written as a letter commencing "Dear Sir," "As instructed by you I inspected," &c. This will conclude with "Yours truly," and be signed by the engineer responsible for the report.
2. Headed "Report on condition of Electrical Installation at," &c., and at the conclusion, merely the signature of the engineer. But this report will be accompanied by a covering letter.

A report should be sub-divided by headings so that any detail may be picked out without reading the whole. An ample margin should be left on the left-hand side of the paper for the sub-heading titles. If, for example, an investigation is being carried out on an overhead crane, the headings may be: Motors (hoist, long travel, cross travel), controllers, switchgear, brake, structure, track, gearing, &c. The selection of titles will depend upon the engineer's judgment.

Necessary Appendices

Where it is necessary to give long lists of items or prices, these should be added as schedules at the end of the report. This rule also applies to any sketches that may have to be included. They should be clearly and unmistakably identified, then attached. By this arrangement the continuity of the report is not broken. Care must be taken to give to each item the prominence that is due to its importance.

The details of a survey may be presented to an engineer, or delivered to a person totally unacquainted with engineering terms. Generally, the surveyor will have an idea for whom the report is intended, and be able to select suitable wording. Always remember that it may be read by more than one person, and great care must be taken to ensure that it will be understood by whoever may read it.

There is need for vigilance when using abbreviations or technical terms. The author once heard an engineer asked in all seriousness if "cam" was a whole word or an abbreviation. To a person hearing an engineer speak of a commutator as a "comm." and a generator as a "gen." "cam" might well be an engineering colloquialism. So it was a perfectly natural question, showing the need for careful wording.

Of course, this avoidance of technical terms is a rather nice point. It is possible to go too far and use unnecessary explanations. It is a question of using one's own judgment. In my opinion, it is better to underestimate the reader's knowledge and make certain that the report is perfectly readable, than to overestimate his knowledge.

The importance of definite and exact statements cannot be too strongly emphasised. It is not sufficient to state that on "10 h.p. m/c No. 1234 the commutator and brush gear require attention." State definitely what attention is necessary.

Incidentally, if it is necessary to suggest any considerable alteration to plant, the engineer while conducting the survey on site will have to carefully consider the practicability of carrying out any recommendations that he may make.

The surveyor signing the report takes the responsibility for any statement or recommendation contained in it. It is his duty to himself to make those statements so clear that they cannot possibly be misunderstood. And it is his duty to his client to make definite recommendations, and not shirk the responsibility of making any necessary decision.

Meter Testing.

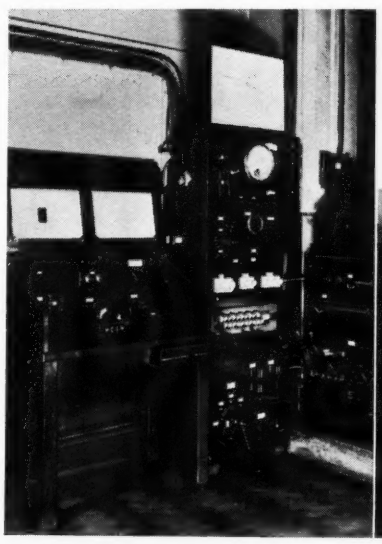
By A. M. Strickland, B.Sc., A.M.I.E.E.

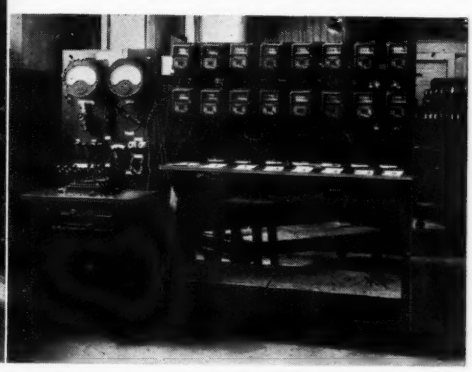
Equipment in a large supply undertaking

A REVIEW of experience extending over some eleven years in the testing department of a large provincial supply undertaking, during which I have been engaged in developing and placing in service several types of testing equipment for somewhat varying duties, may be of assistance to those who are now concerned with the provision of apparatus to meet the requirements of the Electricity Supply (Meters) Act of 1936. Single-phase meter equipments only are considered here, since these are of more pressing importance in regard to certification.

Originally, the supply to small consumers was principally by d.c., the demand for a.c. meters being almost negligible, but the adoption of an energetic programme of changing over to an a.c. four-wire distribution system, together with intensive housing development by both municipal and private interests produced rapidly increasing demands for a.c. meters. Coincidentally, the introduction, and later modification, of assisted wiring schemes by the undertaking caused augmented demands until, at the present time, the requirements for single-phase meters approach 50,000 per annum.

This rapid growth produced peculiar problems. Test room accommodation was increased from time to time by the release of space from other activities in the same building, and the adaptation of existing equipment and the design of new gear were influenced by the available building layout. The same arrangements would not necessarily have been adopted in a new specially designed building, but similar principles would still have applied as regards control arrangements and sub-standard connections.





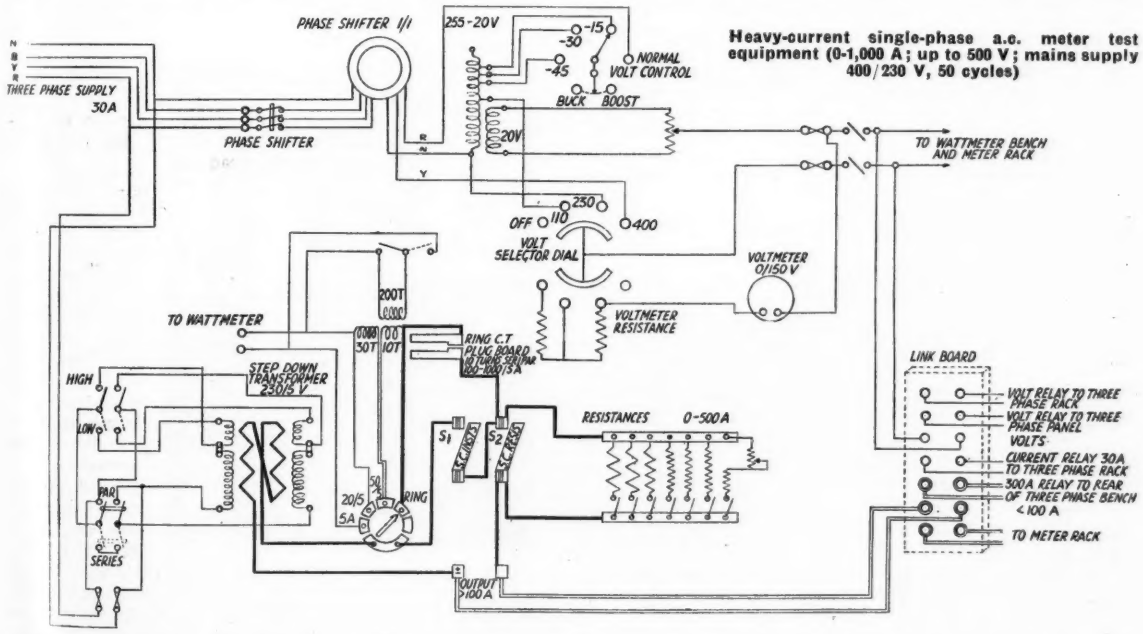
Left: Panel and instrument desk of heavy-current equipment. Below: Volt phase-shifter type of standard meter rack and test bench

Control Benches

Owing to space limitations the equipments were generally designed for use with sub-standard indicating instruments and stop-watches, in order to achieve a rapid completion of small quantities of meters at each test bench. This method is now described in the recently published Regulations as Method C, verification of gearing ratio being obtained by a single dial test.

At one time all ordinary single-phase meter requirements were met by one small test bench in which phase displacement was obtained by means of an induction-type phase shifter. To deal with heavy-current single-phase meters, and instruments of other voltages, an equipment was installed covering ranges of 110-230-400 V, and currents up to 1,000 A. The control panel was wall mounted adjacent to a desk containing the sub-standard measuring instruments. A fixed rack, capable of accommodating any number of meters up to twenty, was fixed alongside the sub-standard desk. For measuring the higher values of current a ring current transformer was employed in which the primary winding was divided into ten equal sections, each capable of carrying 100 A, the ends of each section being taken to a plug board. By this means, various combinations could be arranged from all coils in series for 100 A to all coils in parallel for 1,000 A, the core working under identical conditions on all ranges. Care was exercised in the construction and connection that the windings and connection leads were as nearly as possible identical, so as to obviate the possibility of uneven division of current between parallel sections. With minor modifications, this equipment is still in use for heavy-current meters, experimental tests on sample meters, checking sub-standard rotating meters and for meters of less usual ratings.

In general, all equipments employed for routine testing should be designed for ease and infallibility of operation, so that the individual tester is able to devote all his attention to the immediate work in hand. Permanent connections and simple adjustments for altering circuit conditions should, therefore, be employed. The current supply for the series coil is, in all cases, provided by a step-down transformer operating at constant voltage, variations in load being made by switching in parallel loading resistances on the secondary side. This



Heavy-current single-phase a.c. meter test equipment (0-1,000 A; up to 500 V; mains supply 400/230 V, 50 cycles)

method is considered to eliminate, practically, the possibility of harmonics in the testing current.

In recent years developments in the manufacture of "Mumetal" have made possible the replacement of sub-standard measuring transformers in these equipments by others of greatly improved characteristics.

Voltage Control Arrangements

Where a number of control equipments are to be employed, current must generally be obtained from the supply system. Usually the test room will be at a point adjacent to a distribution transformer, or may have a small transformer specially provided for local use. Although wide variations in voltage will not usually be experienced under these conditions, some control of voltage may be desirable where indicating sub-standards are in use. In addition, an increased voltage for creep test and some simple means of obtaining phase-shift for adjustment on quadrature and testing on lagging loads are required.

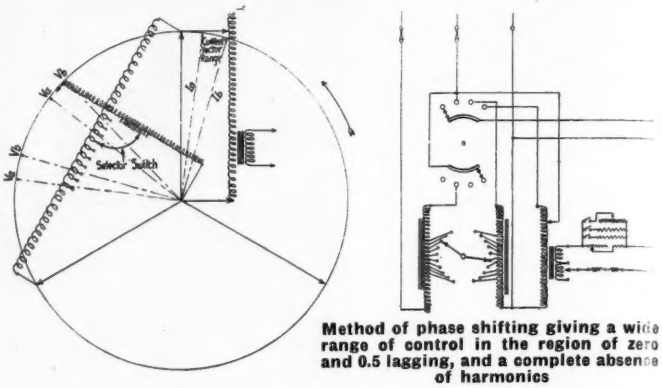
It is not generally appreciated that errors may arise due to contact troubles in switches in voltage circuits, even where the current required is only a small percentage of the switch rating. Ideally, no switches or fuses should be inserted between measuring instruments and meters under test; if their use is unavoidable, the contacts must be extremely reliable, and of substantial design. Considerable attention should be given to this point, and voltage leads of substantial cross-section should always be employed.

In order to facilitate rapid connection and disconnection of meter voltage coils, small plug and socket connections have been used. Here, again, good mechanical construction is essential, otherwise plug connections are not desirable.

For phase shifting, it is generally unsatisfactory to depend only on changing the phase wire to the voltage (or, alternatively, the current) supply. The characteristics of different makes of meters vary considerably, and this militates against uniformity of shift with different makes and varying quantities of meters. Where several equipments are in use, commercial phase-shifting transformers are usually too cumbersome and costly for universal application. Experiments with transformers having more than one core, with windings supplied from different phases, proved unsatisfactory, because of danger of harmonics arising and absence of precise control. The method ultimately adopted gives a wide range of control in the regions of zero and 0.5 lagging, and a complete absence of harmonics. Briefly, the method consists of a tapped auto-transformer connected across two phases, one of which also provides the supply to the transformer feeding the series circuits, together with a second tapped auto connected from neutral to the tapping switch in the first auto. The transformers are liberally designed, and, by judicious use of sufficient tappings, close lag control is possible. The second auto also provides excess voltage for creep test.

This type of control is suitable for dealing with batches of meters up to twenty, but is not recommended for a number considerably in excess of this. In view of the wide variation of the current requirements of meter voltage coils, from 5 mA in certain types to 80 mA in some sub-standard makes, it is desirable to adopt a fairly liberal design. In general, it is wise to allow for a current of 30 to 40 mA per coil in designing equipments.

The above method of control was adopted on a number of test benches, permanently fixed in position, with connections from supply points and also to the standardising laboratory. For use with these benches, a standard rack capable of accommodating thirty-two meters was developed. On account of space limitations these racks were provided with rubber-tyred castors, for portability, and plug connections to a voltage bus-bar. The arrangement has proved flexible and has been satisfactory with several types of meters, including those of the prepayment type.



Method of phase shifting giving a wide range of control in the region of zero and 0.5 lagging, and a complete absence of harmonics

Control panels might be reduced in size by the use of a voltage phase selector switch similar to the Yaxley multipoint type, for rear of panel mounting, and the use of miniature indicating instruments for loading indications. The employment of a completely insulated main switch and fuses controlling the supply to the bench is also recommended.

A New 125-kV Cable

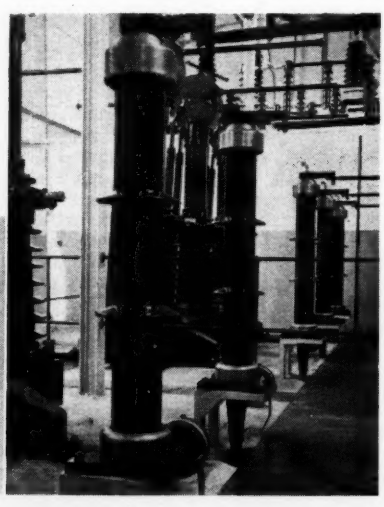
AN oil-filled cable designed to operate at 125 kV has been made in Germany in continuous lengths, each of 1,650 ft., in order to avoid the need for joint boxes. It has been laid as six single conductors, side by side in troughs, to form two separate groups of cables; each group being of sufficient capacity to carry the whole load. This arrangement obviates risk of interruption of supply, since failure might cause solidification of the electrolytic melting baths at the Rheinfelden aluminium works, where the new cable has been installed to connect nearby overhead lines with the rectifier house.

Left: A section of the new cable. Right: Terminal arrangements in a rectifier house

The cable has been made by the Siemens-Schuckertwerke and it has a hollow aluminium conductor consisting of two layers of flat-section wire stranded around an internal spiral. The active cross section is 0.147 sq. in., which gives sufficient protection against a thermal short circuit. The thickness of the insulation is 0.53 in.

The lead sheath is protected against corrosion by means of a suitable coating and a spiral of Aldrey tape serves as reinforcement against internal pressure. Further protection in the form of bitumen covered india-rubber guards against stray earth currents and chemical attack. A final layer of flat wire and an outer protective coating complete the cable.

The cable terminates in 132-kV indoor type end-boxes with non-cemented "Repelite" insulators. These are provided with two drip covers each, to carry off moisture condensed from the air. For the same reason the flash-over length of the insulators was increased from 39.5 to 47.5 in. The cable-end boxes are mounted at a height of 32 ft. in the rectifier house, opposite the transformer terminals. For the reception of the oil, equaliser vessels are provided at either end of the cable near the end boxes and are connected to the earthed housings of the latter by piping. Storage is provided in the rectifier house to provide sufficient oil in case a leak should develop.



The incoming power is controlled by expansion type circuit-breakers with double isolating arms. The elimination of separate bus-bar isolating switches results in simplification and economy of space.

Boiling-plate Characteristics. By W. B. Parker

THE recent British Standard Specification for the testing of hotplates stipulates the use of the most suitable utensil for the particular plate to be tested and thus gives the maximum efficiency in every case. Such tests are needed in order to gauge the effects of improvement in the design of any particular plate, but they do not necessarily give a true criterion of the results which would be obtained in the average kitchen with the utensils most likely to be used with it.

The problem of special utensils

It was in order to obtain a clearer view of the relative advantages of solid and radiant plates, and of special and ordinary utensils that the present series of tests was undertaken. Three main classes of plate were used, *viz.*, solid, radiant and semi-radiant.

The solid type is inefficient if there is not close contact between plate and utensil because without such a contact heat is transferred by radiation, and owing to the large mass of the plate some time must elapse before the surface temperature can rise sufficiently for free radiation. Where the gap between the plate and utensil is small, heat transfer takes place by conduction also, but the surface temperature of the plate will rise to a much higher value than it would were there metallic contact on account of the poor thermal conductivity of air.

The author assesses the advantages and drawbacks of various types of hotplate and gives the results of boiling tests

The radiant type provides no contact between element and utensil. The transformer-operated plate is the only one in common use on cookers in this country, the exposed-spiral open plate having gone out of favour. With these plates radiation is the chief method of heat transfer, and the factor most affecting efficiency is the radiation coefficient of the pan bottom. Enamel-ware and blackened aluminium pans give the best results and bright aluminium the poorest, the degree of flatness of the pan base making little difference.

Semi-radiant plates differ greatly in construction but they all have two characteristics in common: (a) a relatively small mass and resulting low thermal capacity which enables the surface temperature to rise quickly and heat to be dissipated effectively by radiation, and (b) actual contact between element and utensil. These plates are less affected by the type of utensil than either of the other two, since heat transfer can readily take place by both radiation and conduction. Two plates of this class were chosen for test, the first of the "Chromalox" type with two flat, concentric rings, and the other the tubular-sheathed element type with aluminium reflector. The "Chromalox" plate resembles the solid type in that best results are obtained with flat-base pans. The solid and tubular-sheathed types tested were "Magnet" plates for the loan of which I am indebted to the General Electric Co., Ltd.

Kitchen utensils commonly in use fall into three categories, namely, special flat-base type, ordinary aluminium and enamel-ware. Five 8-in. diameter plates were tested with the two most suitable utensils holding 1, 2, 3 and 4 pints. Each test was done at least twice, the results given being averages, and were taken from 60 deg. F. to the commencement of free ebullition.

During each test the consumption was metered, and, in order to compensate for voltage variation and for any possible difference between the actual and rated loadings of the plates, the boiling times quoted are calculated from the observed consumptions and the rated loadings. In addition, each test was timed and the actual loading was calculated from the boiling time and the consumption. If, for any test the actual loading differed considerably from the rated loading, it was concluded that the voltage had varied too much from normal and the result was disregarded.

The results, which are shown in the accompanying table, give considerable justification for the claim that there is at present nothing better than the solid plate if it is used exclusively with special utensils, but the whole question depends upon the provision of these utensils. It must be remembered that the modern high-loaded solid plate dates back more than ten years and yet the proportion of these plates which are being used with proper utensils is still low. One cannot help wondering whether the securing of the universal adoption of the special utensil will not after all prove a hopeless quest which will eventually be abandoned.

The solid plate is certainly much inferior to other types for frying. With a cheap light-gauge fry-pan it was found on test that a rasher of bacon began to fry in about one minute on the transformer-type radiant plate, in under 1¼ minutes on the tubular-sheathed element plate, and in 2 minutes on the "Chromalox" plate. With a special fry-pan the corresponding time for the solid plate (1,800 W) was 4 minutes.

In any case it is significant that the leading American and Canadian manufacturers are now using the red-hot type almost exclusively. A factor which has probably contributed to this is that in those countries the exposed-spiral open plate did not go out of fashion to the same extent as here, because with their practice of supplying cookers on three-wire services with elements at 115 V, these plates are much more robust and satisfactory than on our higher voltages. For this reason solid plates and special utensils have not been adopted to the same extent as in this country. In Germany, also, the red-hot plate is making good progress.

The removable reflector is a disadvantage of the present tubular-sheathed element plate, but investigation made during the tests of the effect of a dirty reflector and of the substitution of a refractory baffle showed a surprisingly small reduction in efficiency. This was attributed to the fact that the particular plate tested had the tubular element well flattened on the top surface to increase the area of contact with the pan so that much of the heat transfer was by conduction. In any case, there are plates of this type without any exposed reflector on the market in America and Germany.

In justice to the solid plate and special utensil it must be pointed out that their adoption enables the maximum efficiency to be obtained from the grill-boiler, which is a point of considerable importance with cookers provided with only one boiling plate. Also it must be recognised that the present tests are somewhat unfair to the transformer radiant plate since they give it no credit for being the only plate which retains full speed and efficiency with a utensil only 6½ in. in diameter which would often be used in practice. The isolated centre element at medium heat enables the "Chromalox" and tubular-sheathed plates to be used efficiently with a small pan, but at the expense of speed.

The thermal inefficiency of all electric boiling-plates when boiling small quantities from cold is not in itself very important, since such operations represent only a small proportion of the total consumption for cooking. In any case, with the low rates prevailing in many areas a half-pint of liquid can be heated on an electric hot-plate for the price of the match used to light a flame stove. Speed from cold when boiling small quantities is quite another matter and is of the utmost importance.

Plate.	Watts.	Utensil.	Efficiency.	1 pint.	2 pints.	3 pints.	4 pints.
			per cent.	min. sec.	min. sec.	min. sec.	min. sec.
Tubular-sheathed ...	1,800	Enamel	54.5	5 0	7 20	9 40	12 0
Solid	1,800	Spec. aluminium	51.2	5 50	7 50	10 10	12 20
Chromalox	1,550	" " ...	50.6	6 0	9 15	12 20	14 55
Solid	2,250	" " ...	49.5	4 50	6 25	8 30	10 10
Tubular-sheathed ...	1,800	Ord. aluminium .	48.5	5 40	8 20	11 0	13 10
Chromalox	1,550	" " ...	48.3	6 35	9 30	12 45	15 40
Transformer radiant...	2,200	Enamel	37.8	5 10	8 25	12 5	14 25
Solid	1,800	Ord. aluminium .	37.0	7 50	10 50	14 30	16 50
"	2,250	" " ...	36.3	6 10	8 50	12 0	13 50
Transformer radiant...	2,200	" " ...	30.9	7 40	10 30	14 10	16 40

The initial heating-up period, which accounts for the slow-boiling of small quantities, can be shortened in only two ways—by reducing the thermal capacity and by increasing the loading. The first method has been carried about as far as is practicable in radiant and semi-radiant plates, and the second brings difficulties in the way of reduced life and too high loading at low heat.

An ingenious method of overcoming the slow initial heating of solid plates is used with considerable success in Germany. This is the "*Schnellheizschalter*" or "quick-heat switch" and is a means whereby the voltage between phases (380 V) may be applied to a plate designed for 220 V. When the plate reaches a certain temperature a relay operated by a thermostat reduces the voltage to normal by connection between phase and neutral.

Under these conditions a plate loaded at 1,800 W takes no less than 5,400 W, but apparently no harm is done since the plate cannot become over-heated. This method could not be

used in this country where it is unusual to bring more than one phase into a house, but it might prove feasible to provide an extra spiral on the plate controlled by a thermostat and only in circuit with the switch at "high." Another possibility is a solid hot-plate controlled entirely by an adjustable thermostat. In this case the loading could be very high and the heat would be infinitely variable down to the slowest simmer, although only a single spiral would be required in the plate.

Another question which was examined while making the above tests was that of rectangular *versus* circular plates. Rectangular plates have two advantages over the circular type: (1) they accommodate two utensils more conveniently; (2) they are more easily fitted in a hob of restricted dimensions. Against this they are of lower efficiency and slower in boiling—in the tests some 20 per cent. slower. One reason for this is that they are usually somewhat lower in loading than circular plates of the same type. Thus for the normal and high-loaded solid plates the loadings for the 8 in. circular size are 1,800 and 2,250 W and for the 8¼ by 6¼ in. 1,700 and 2,000 W respectively. In the tubular-sheathed type the loadings for plates of these dimensions vary with different makes from 1,600 to 1,800 W for the circular plate and from 1,450 to 1,600 W for the rectangular. The other reason for slower boiling is that when using an 8-in. diameter pan on an 8¼ in. by 6¼-in. plate about 16 per cent. of the area of the plate is left uncovered.

The adoption of rectangular plates also greatly restricts the choice of hotplate. There are now several successful plates of 8 in. diameter which are unobtainable in rectangular form and future developments may bring highly satisfactory designs of hotplates which will prove impracticable in any but circular shape.

It is difficult to decide which type of plate is preferable in the interests of the development of electric cooking since so many factors have to be considered, some of which, such as the question of first cost and maintenance, are outside the scope of the present article. However, although there is admittedly much room for difference of opinion, the results of the present series of tests seem to suggest the ultimate abandonment of the solid plate in favour of a type less affected by the utensil used. Commercial cooking is quite a different question and in this sphere the solid plate is more likely to remain in favour.

Applying for an Appointment. By A Chief Engineer

What an employer looks for

OCCASIONALLY it falls to the lot of those holding higher executive positions to advertise and select candidates for appointments on the staff, and as in itself it is no easy matter to select the most suitable applicant, or even a limited number who would appear most suitable for interview, it might be helpful to the candidates themselves to be given a few tips, from the prospective employer's point of view, how best to set about making their applications.

First, as to the employers themselves. Remember that in very many cases they have risen from exactly the same positions as you yourselves now occupy, and have experienced all your youthful ambitions and enthusiasms. You may be sure that in the majority of cases they admire your ambition, and would willingly do much to help your progress, but you are only one out of a large number of applicants, and cannot be sorted out for special favour. Think for a moment of the amount of time which will be required to read carefully and finally make a selection for the purpose of interview from perhaps a hundred applications, and also bear in mind that as the person making the appointment is usually a very busy man, that it all has to be done in his scanty leisure.

I myself once had three hundred and eleven replies to a single advertisement, and each of these I read conscientiously, many of them several times, before I was finally able to select six for interview. All of this had to be done quietly at home in the evenings because there was little or no time in the office, and further the constant interruptions prevented the concentration necessary to do justice to every applicant.

The Best Man Wins

Each candidate, therefore, should consider how best he can assist in this difficult selection, remembering always that if he is the best man for the job he is the one wanted, and that no other consideration carries any real weight. For this reason do not state that you wish to move because your wife does not like the district she is now in. It is a waste of the selector's time to have to read this, and might possibly prejudice him against the candidate. On the other hand, state clearly and concisely exactly what you are doing now, and have done, preferably commencing with the position you now hold, as much of your previous experience can only be interesting historically.

On the theory that you have achieved your present position by progressive improvements, which is probably true of 90 per cent. of the applications, you may dispose of the earlier appointments in a very few lines, for your prospective employer will realise that your continued improvement can only be as the result of proficiency in your earlier jobs. Now for a few general don'ts.

1. Don't use your present employer's stationery when making your application. It cuts no ice to have the crest of your particular undertaking on the back of the envelope in which your application is enclosed. On the other hand, it may suggest that you are not above petty pilfering, a fatal suspicion if you are applying for, say, a showroom appointment where there is so much to which you could help yourself without much risk of detection.

2. Don't write and say you have been in close touch with things you have never really handled. It does not deceive, and is apt to irritate those who have many applications to deal with.

3. Don't fail to realise the fact if you are not a good writer. The mere fact that you are not a good writer will not necessarily prejudice your chances, unless perhaps you are applying for a clerical appointment, but if your application is barely readable, or, as the writer has seen, your signature is quite undecipherable then if it is at all possible use the typewriter, or if you are not able to obtain the use of one, devote a little extra care to the preparation of your application, and particularly make sure that your name can be deciphered, even if you have to repeat it in block letters.

4. Don't spend too much time over where you went to school, but state clearly any diplomas and certificates you have gained. The old school tie may be important to you, but your prospective employer may be of a different school and not regard yours in the same light.

5. Don't waste time setting out statistics of your present undertaking that have no direct bearing on your application. The units sold, the number of consumers and similar information can always be turned up in one or other of the manuals if necessary. On the other hand, it may be interesting to learn that you doubled the turnover of the showroom, or that you personally have laid 100 miles of mains.

6. Don't mark your application "Confidential." If you want the job you must expect fullest inquiries to be made. On the other hand, the fact that you have applied will not be divulged unless you are fortunate enough to become one of the final selected candidates. Arising out of this, never fail to state the undertaking by which you are at present employed. Again, the fact that you have applied for another position will not be divulged unless you are selected, and then this information becomes important.

7. Do not enclose a stamped addressed envelope for a reply, or a photograph, unless asked to do so. It will not ensure your getting an interview, and is apt to be a nuisance to the selector and be overlooked after all at the finish.

8. Do not write in a week after you have sent your application to inquire how the selection is getting on. If you are wanted you will be called in due course, and if you are not considered suitable no amount of inquiry will make you so.

9. Don't send eight testimonials as one candidate did. Three at the outside are quite enough to tell just how good you are. Also, testimonials twenty years old are not of much value. If you have been in one job for a very long time do not worry because you cannot send three up-to-date testimonials. The fact that you have been in one job so long is usually sufficient testimonial in itself.

Finally, a word as to advertising under a box number. Many likely candidates are shy of replying to box number advertisements, perhaps with good reason, where salaries and conditions are not stated, but there are occasions when employers resort to this method for their own protection.

On one occasion, when advertising under the name of my undertaking, I had nearly forty letters or 'phone messages asking special consideration for this or that candidate. Many of these came from representatives of various firms, who quite wrongly persuaded either themselves or the candidates that they had some real influence which could be exerted in favour of particular candidates. Candidates should not be deceived into thinking that because a certain firm's representative knows Tom, Dick or Harry employed by the advertising undertaking he is able to put in the word which will ensure any particular person obtaining the appointment.

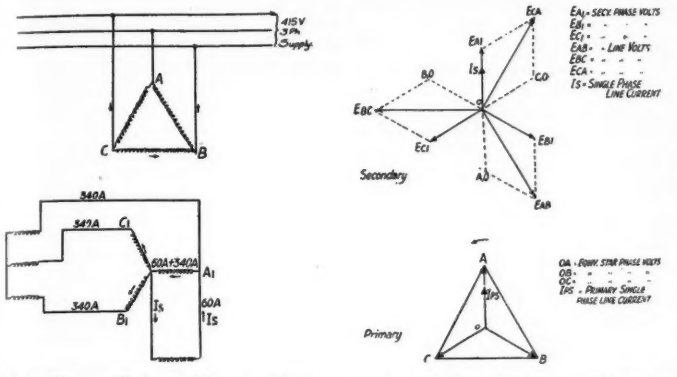
There may, of course, be exceptions, but if so they are very few. Generally the only real thing that matters to the advertiser is obtaining the right man for the job, and by the practical nature of his application the candidate himself can usually exert a far greater influence than that of all his friends combined.

Single-phase Loading of a Three-phase System

By K. C. Howison, Grad.I.E.E.

A comparison of the two principal methods, bringing out the points to be considered in making a choice

IT is sometimes desirable to obtain a single-phase supply for factory use, as, for example, a resistance welding load. To connect such equipment between phase and neutral means heavy currents being carried by the supply leads at 240 V. This can be avoided by installing in the works substation a separate transformer to supply the particular plant, which can thus be fed at high voltage and stepped down by the welding transformer. Expense is the chief objection to this method, in addition to the fact that no better balance



Case 1.—Fig. 1: Unity power factor. Single-phase load between A phase and neutral. Three-phase load between lines. Fig. 2: Vector diagrams. Vectors of three-phase line currents are omitted, and phase displacement due to internal impedance drop is neglected

of loading will be achieved. If the capacity of the single-phase load is large compared with that of the main works transformer the out-of-balance load will result in decreased efficiency and bad regulation of the latter. Also, its output will be reduced, since the loaded phase can only carry a smaller three-phase load, and the other two phases must run underloaded. Since such operations as welding are intermittent, balancing by arranging lighting circuits on the other phases does not help very much (see fig. 1).

The total output of the transformer being the sum of the outputs of the three phases, it will be seen that when two phases are working at reduced output the output of the transformer as a whole must be reduced. The copper loss in the loaded phase remains high together with the normal iron loss; hence the efficiency will be reduced.

In the vector diagrams of this first case (fig. 2) a 290-kVA transformer with a maximum current per phase of 400 A is assumed connected delta-star. For the sake of clarity the current vectors of the three-phase load have been omitted. Considering,

Case 2.—Fig. 3: Unity power factor. Single-phase load between A and B lines. Three-phase load between lines. Fig. 4: Vector diagrams as in Case 1

therefore, the loaded phase A_1 of the star connected secondary, the phase volts are represented by the vector E_{OA_1}. Since the load is single phase, this also represents the line volts. For a non-inductive single-phase load the *line* current is in phase with the *line* volts. Hence the single-phase load current is represented by OIs in phase with OA_1.

Now on the primary, which is delta connected, the only balancing ampere turns are in phase A. Since single-phase only is flowing in the secondary (remember we are neglecting the three-phase load) single-phase current must also flow in the primary, in phase opposition to the secondary current. $I_{P.S.}$ represents the primary single-phase current, which by virtue of the assumed transformation ratio of 1:1, is equal in phase and magnitude to Is.

In the second case the same transformer has a single-phase load fed at 415 V between lines (fig. 3). Since the single-phase load has the same kVA capacity (as in fig. 1) and the voltage of supply is now $\sqrt{3}$ times greater, the line current is $\frac{1}{\sqrt{3}}$ times as great. Hence, the current loading of each phase due to the single-phase load is decreased in this ratio. The out-of-balance is thus reduced and the available loading capacity of the transformer as whole is increased. In the vector diagrams of this method (fig. 4) the phase voltages are again represented by vectors E_{OA_1}, E_{OB_1} and E_{OC_1}. In this case, however, the line voltage is the vector sum of two-phase voltages $E_{A_1B_1}$, $E_{B_1C_1}$ and $E_{C_1A_1}$. Now, since the load is non-inductive, the line current Is is in phase with the line volts, being a single-phase load. Hence current vector OIs (made up of OI_A and OI_B) is in phase with $OE_{A_1B_1}$.

The current vectors OI_A and OI_B are therefore 30 deg. out of phase with their respective phase voltages, in one case leading by 30 deg. and in the other lagging by 30 deg. On the primary side the same conditions obtain, since single-phase current only flows in phase opposition to the secondary current. In both cases the three-phase loads supplied are at unity power factor and the line current is in phase with the *phase* volts.

The relative loadings of the two methods are: In Case 1 a 290-kVA transformer, three-phase, 415 V, maximum current loading 400 A per phase, carries a single-phase load of 14.4 kVA and a three-phase load of 244.5 kVA, both at unity power factor. The single-phase load is fed from phase to neutral. The full load copper loss is 4 per cent. and the iron loss amounts to 1.5 per cent.

Now the three-phase output is 3 $E_{ph.}$ $I_{ph.}$ cos $\phi = 3 \times 240 \times 340 \times 1 = 244.5$ kW. The single-phase output is $E_{ph.}$ $I_{ph.}$ cos $\phi = 240 \times 60 \times 1 = 14.4$ kW. The combined total output is 259 kW.

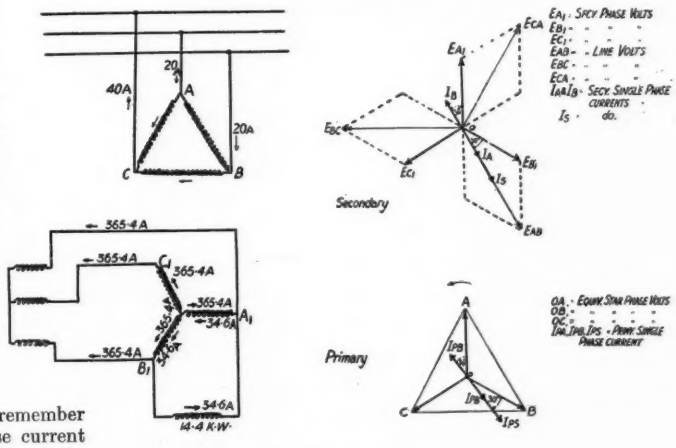
The three-phase output is 244.5 kW

The copper loss is $\frac{244.5}{1} \times .04 \times \frac{244.5}{290} =$ 8.26 kW

and the iron loss is $290 \times .015 =$ 4.35 kW

Added together the three-phase input is 257.11 kW

The single-phase output is 14.4 kW and the copper loss is


EA1 = SECY. PHASE VOLTS
EB1 = " " "
EC1 = " " "
EAB = LINE VOLTS
EBC = " "
ECA = " "
IAB IB = SECY. SINGLE PHASE CURRENTS
IS = do.
Secondary
Primary
OA = EQUIV. STAR PHASE VOLTS
OB = " " "
OC = " " "
IAB IPB IPS = PRIMARY SINGLE PHASE CURRENT

$14.4 \times .04 \times \frac{14.4}{96.5} = 0.086$ kW. Added together the single-phase input is 14.486 kW. Thus combined single- and three-phase inputs make a total of 271.596 kW. Therefore the efficiency is $\frac{259}{271.59} \times \frac{100}{1} = 95.5\%$.

In Case 2 the same transformer as before now has a 14.4 kVA single-phase load at unity p.f fed between lines at 415 V. Since the single-phase current is now $\frac{60}{\sqrt{3}} = 34.6$ the three-phase current can be increased to 365.4 A. The three-phase output is $3 \times E_{ph.}$ $I_{ph.}$ cos $\phi = 3 \times 365.4 \times 240 \times 1 = 263$ kW.

The single-phase output is $2 \times E_{ph.}$ $I_{ph.}$ cos$\phi = 2 \times 240 \times 34.6 \times .866 = 2 \times 7.2 = 14.4$ kW. The combined total is thus 277.4 kW.

(*Continued at foot of next page*)

Meetings and Discussions

At a meeting of the Institute of Marine Engineers on Tuesday the operating results of boilers run at high pressures and temperatures were reviewed by Professor A. L. Mellanby. The views of manufacturers on the design of switchgear for mines and customers' requirements formed the subject of a paper read by Mr. J. H. Epps before the Association of Mining Electrical Engineers last week; a number of well-known mining men contributed to the discussion. Two types of noise meter were described at last Friday's meeting of the Meter and Instrument Section of the I.E.E.—the outcome of work at the N.P.L. and the Dollis Hill Research Station. Mr. E. T. Norris's paper on voltage regulation (abstracted in our last issue) was discussed at the I.E.E. on February 3rd.

High-pressure Boiler Results

A PAPER by Prof. A. L. Mellanby which was read before the INSTITUTE OF MARINE ENGINEERS in London on February 8th reviews the performances of several types of high-pressure steam boilers of which actual marine experience has been obtained.

The paper is largely based on information presented by manufacturers and deals entirely with boilers that depart from the natural circulation principle of conventional water-tube designs. Attention is directed to the fact that when very high pressures are used interheating (with its increased complication of circuit) must be adopted. Considerable attention is given to heat transmission and the effects of gas temperature and velocity upon the conditions in the tubes.

The La Mont, Velox, Loeffler, Sulzer, Benson and Schmidt boilers are discussed in some detail. Some ships' installations include air preheaters and economisers, and others do not; thus a true comparison of their relative performances cannot be made, but the author states that there is no particular reason why any one type should be more efficient than the others. From the figures supplied to him, it might be assumed that a fuel efficiency of about 90 per cent. is possible with a fully equipped plant.

When the steam pressure and temperature are high, very pure feed water is a necessity, because the high rates of heat reception which characterise the new styles of boilers impose an obligation to avoid scale formation (which resists heat transference) on the inner tube surfaces. In this respect the author suggests that the Schmidt boiler has the greatest margin of safety, and that the Loeffler boiler (with its indirect method of evaporation) should also be in a favourable position. Deposits may also give trouble in the turbine. The sodium salts used in the feed treatment volatilise in the superheater, and are deposited on the turbine blading, thus cutting down the power output. Some designs of steam washer are stated to get over this difficulty.

The difficulties associated with steam drums at high pressure are appreciated by the designers of most of the new plants. The Loeffler steam drum is removed altogether from the region of the flue gases, and therefore does not experience trouble due to internal heating. Its symmetrical shape and its freedom from holes in the circumference also avoid bending moments which may produce very heavy stresses. The Velox boiler (with its steam separating drum) is in a similar happy position, but attention will be required in the design and construction of the steam and water collectors at the top and bottom of the combustion chamber. The Benson and Sulzer boilers solve the problem by omitting the drum altogether and, incidentally, save appreciably in constructional cost and weight. In these two cases the old question associated with water and steam reserve must arise. The displacement of the Scotch boiler by the water-tube boiler pushed this problem greatly to the fore, and it seems that there is now another chance of its intrusion in association with the development of the drumless boiler.

Single-phase Loading (*Concluded from preceding page*)

The three-phase output of 263 kW plus the copper loss of $\frac{263}{1}\times.04\times\frac{263}{290}=9.54$ kW and the iron loss of $290\times.015=4.35$ kW makes the total three-phase input 276.89 kW. The single-phase output of 14.4 kW plus the copper loss of $14.4\times.04\times\left(\frac{14.4}{193.0}\right)=.043$ makes the single-phase input 14.443. The single- and three-phase total input is 291.333 kW.

Thus the second case efficiency is $\frac{277.4}{291.33}\times\frac{100}{1}=95.35\%$, which is slightly lower than in Case I, while the load-carrying capacity is considerably higher. These values would show a greater variation if the loads were working at reduced power factors, as the three-phase load would almost certainly do in practice.

When deciding on the method of taking a single-phase load from a three-phase system the principal points to be borne in mind are the unbalanced effect and voltage regulations resulting from it, together with the capacity of transformers and consequent loss of efficiency due to its poor loading. In addition there are, of course, various schemes of three to one phase transformation.

High-pressure Boilers Switchgear for Mines Noise Measurement

Mine Switchgear

SOME of the problems encountered by manufacturers of switchgear for use in mines were under discussion at the meeting of the London Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS on February 1st.

Mr. J. H. Epps presented a paper on the subject, emphasising that sometimes the purchaser could be more explicit in specifying his requirements. When a colliery engineer was asked by his management to state his recommendations, together with cost, for a given layout, he could call in the manufacturers' representatives to discuss the duties to be fulfilled and await the manufacturers' suggestions. This method had many advantages for both parties, but under present-day business conditions the engineer could not avoid the preparation of specifications.

The rating of overload trip coils, leakage transformers, and similar equipment needed very careful consideration. The overload releases on the ordinary mining type oil-immersed circuit-breaker were usually of the series pattern, housed within a limited space. Frequently, manufacturers were asked to provide protection for a three-phase circuit of 10-A rating when the fault kVA might be of the order of 25 MVA at 3.3 kV. To provide space for a suitable coil would mean a circuit-breaker of unnecessarily large dimensions. The only reasonable alternative was to fit transformer-operated coils, the primary windings of the transformers being of adequate cross-section and bracing to withstand the stresses of a 25-MVA fault. For breakers of 25-MVA rupturing capacity for use on 3.3-kV three-phase systems the lowest rating for series overload releases would be approximately 25 A. If coils of a lower rating were used the circuit-breaker must be considered to have a lower rupturing capacity.

For the usual leakage protective system a sensitivity of 5 per cent. of the full-load current was specified. From the safety point of view only it was difficult to explain why a 100-A circuit should be allowed to remain in operation until the leakage was 5 A, although a 20-A circuit must be tripped with a leakage of 1 A only. That state of affairs had arisen from the use of a percentage sensitivity instead of a definite value, and the author thought it was time that manufacturers and users agreed upon a suitable leakage-tripping value which would give reasonable protection and would also allow the manufacturer to include primary windings of adequate rating in respect to short-circuit conditions.

The establishment of a Government testing station for flameproof apparatus was a blessing, both to manufacturer and user, but to what extent should manufacturers continue to invest money and time in certification? Although much had been done to standardise switchgear and its associated apparatus, due undoubtedly to the influence of the Mines Department, finality had not been reached, so that manufacturers must regard some of the capital already expended in certification as a dead loss. The percentage of switchgear certificates involving new designs was particularly low, possibly due to the initial cost of certification, having regard to all the variations involved, and it was part of the price industry must pay for greater safety.

Switchgear of the metal-clad, oil-immersed, draw-out type had been favoured for many years past. As to the future, if system voltages were raised (and some pits were using 6.6 kV below ground) the use of the oil circuit-breaker would continue for reasons of insulation and rupturing capacity.

In the subsequent discussion Mr. J. A. B. Horsley (H.M. Chief Electrical Inspector of Mines) said that perhaps some colliery engineers were asking for leakage tripping settings which were very difficult to achieve and which were unreasonably severe. Settings of the order of 2½ per cent. calculated on a 50-A switch represented very sensitive and delicate windings for the relays and other parts of the trip circuit. At

present the requirements of the law regarding flameproof enclosures underground were not very definitely stated, and he hoped that as the result of the report of the Royal Commission the position might be made more clear. Mr. Epps replied that a lead should come from the Mines Department in connection with leakage protection. The difficulty was in connection with the primary windings of the core balance transformer when the current was low. If a value of 4 or 5 A could be adopted, which would meet reasonable conditions, the problem would be solved to some extent.

Mr. J. R. Cowie (past-president of the Association) said that 5 per cent. might be a difficult value; 10 per cent. might be better, depending on the general size of apparatus, and probably 20 per cent. would be a more sound commercial figure. Mr. Epps replied that it was most difficult to make an engineer appreciate that 50 per cent. leakage protection on a 10-A circuit was a protection equivalent to 5 per cent. on a 100-A circuit. Perhaps something could be done through the Mines Department or the B.S.I. specification committees to thrash the matter out with a view to arriving at a definite value.

Mr. J. R. Walton stated that there was a draft specification which gave a definite current value for leakage trips rather than a percentage, and he believed it was 7½ A. That should pave the way to further progress in that direction. Mr. Epps said he believed the draft specification mentioned related to air-break controlled gate-end starters for use on cutters and conveyors. If 7½ A could be permitted on trailing cables, surely that value could be permitted on the larger and stronger cables for the main distribution. He agreed with Mr. J. W. Wilkinson (Branch president) that a manufacturer could deal more easily with an inquiry which specified what had to be accomplished by the plant required, than with one for a quotation for some closely specified equipment. If the duty were indicated, it was up to the manufacturer to put forward what he knew to be the best equipment for that duty.

Dr. W. Zwanzig, referring to earth leakage protection, said he believed that to a certain extent colliery engineers were justified in asking for different settings. Differentiation between the settings would enable a fault to be located within a comparatively small section.

Measuring Noises

TWO papers were presented at the February 4th meeting in London of the Meter and Instrument Section of the INSTITUTION OF ELECTRICAL ENGINEERS. One of them, by Dr. A. H. Davies (National Physical Laboratory), relates to an objective noise meter of the microphone-amplifier type which has been adjusted for measuring the equivalent loudness of noise.

Many instruments constructed on similar lines are available commercially, but the author states that he has not met with any (other than those based on designs supplied to firms by the N.P.L.) which give results even approximately correct for a series of impulsive sounds. The essential feature of the author's work has been the adjustment of the circuits of the meter so that it will give correct results for intermittent and impulsive noises as well as for continuous tones.

Mr. R. Berry assisted the author with the design of the portable acoustimeter which formed the basis from which the objective meter was developed. When constructed according to the specification contained in the paper the instrument is sensitive enough to measure sounds down to about 40 phons in loudness. It agrees well with the ear for noises of equivalent loudness of 80 phons or greater, and to a lesser extent down to 60 or 70 phons.

The best adjustment for the frequency response appears to be that associated with Fletcher and Munson's work on hearing in the region of 75-80 phons equivalent loudness, although adjustments to levels of 65 and 90 phons gave results which were well within the range of average individual aural measurements.

The author points out that meters which pass a certain specification for sound-level meters which has been tentatively proposed recently may give results for impulsive sounds very much below the true values of their equivalent loudness. An important point revealed incidentally is that inconsistencies arise in aural measurements when the loudness of the noise is compared with that of a reference tone heard simultaneously. The difficulties are resolved by adopting a technique in which the noise and the reference tone are heard alternately.

The Psophometer

The second paper, by Mr. H. R. Harbottle (P.O. Research Station, Dollis Hill), is concerned with a circuit noise meter, or psophometer, which has been designed for measuring the disturbing effect of power induction on telephone conversation.

Prior to the adoption of this objective method several subjective means had been applied, chiefly in America and Germany. Tests made by the British Post Office to determine the reduction of articulation efficiency (*i.e.*, the percentage of meaningless monosyllables correctly transmitted) caused by single frequency disturbances across the receiver showed the possibility of deriving a curve which would indicate the number of millivolts of a single-frequency a.c., measured across the receiver terminals, which will cause a 5 per cent. loss of articulation efficiency.

The inverse of such a curve (frequency weighting) will give the relative disturbing effects, referred to a 5 per cent. loss, of different frequencies. A valve voltmeter was constructed which had a frequency characteristic similar to the weighting curve, and the output was measured with a thermal instrument, since the r.m.s. law of addition is definite.

During a meeting of the Commission Mixte Internationale at Dollis Hill, the delegates made comparative measurements of four different types of disturbance by the American, German and valve voltmeter methods. It was agreed that the last-mentioned should be developed and that the precise specification for the actual instrument should be determined by the Comité Consultatif Internationale des Communications Téléphoniques à Grand Distance.

The latest proposals are explained by the author, who states that comparative measurements of the induction from the Midi Railway (which is supplied with power through mercury-arc rectifiers) to the overhead communication lines of the French Administration have shown that psophometer performance fully justifies this method of noise measurement.

Psophometer construction is described in the British Electrical and Allied Industries Research Association's publication M/T38. The first commercial model on similar lines was produced by the General Electric Co. at Coventry about a year ago. Others have been constructed by the Siemens and Halske concern in Germany, by the Swedish Administration and Ericsson's, by Standard Telephones and Cables, Ltd., in England, and by the American Telephone and Telegraph Co. in America.

Voltage Regulation

THE moving-coil voltage regulator described in the paper by Mr. E. T. Norris (to which reference was made last week) was discussed at the INSTITUTION OF ELECTRICAL ENGINEERS in London on February 3rd.

Mr. A. G. Ellis indicated that the moving-coil idea was not exactly new, but the author was right in not attempting to move the "line" coil. He had not mentioned any loss figures, so they might be assumed to be as large as those of any other type of regulator. The tower-like design, though neat, was perhaps not so rigid as could be desired in view of short-circuit forces in the coils. This type of regulator might do for existing feeders, but when new transformers were being installed it would be more economical to adopt tap-changing gear, which was not so "fearsome" as the author suggested. The question of economics had been glossed over in the paper. While the author avoided the use of moving contacts, he employed up to eight motors for actuating one regulator. The risk of noise production could not be less than in the case of a standard transformer.

Mr. J. K. Webb contrasted the operation of the earlier models with the performance of present regulators, suggesting that they might be designed to produce a larger degree of magnetisation without increasing the leakage effect.

Dr. W. Wilson said that the differential principle had been effectively applied by the author, but it should be compared with on-load tap-changing which, complicated at first, had been much simplified since it was realised that it was not necessary to include a flywheel effect. Both were motor-operated, and it seemed easier to design moving contacts, which had proved themselves in service; tap positions could also be easily signalled. When hot, transformer oil was not a lubricant; it might be actually resistive.

Mr. W. Burton explained that one could not really deal with more than 10 per cent. original voltage drop, because the initial drop was increased by the insertion of the regulator. The capability of the moving-coil type to withstand short-circuits was astounding. He had been a user of several such regulators for a year. Though the losses were slightly greater, no maintenance whatever had been required as there was nothing to need it except, possibly, the relay. The actuating motor was very simple, but it might be convenient if provision were made for running the coil down quickly by means of a higher-speed motor. He did not favour the installation of regulators in consumers' houses. It had been said that they would be needed only for lighting, but he considered it would become necessary to regulate cooker circuits, though it might be avoided in the case of heating circuits. They would have to cater not only for average conditions, but also for peaks created by cold snaps. High-voltage supply was better than too many boosters.

Mr. J. B. Morgan said he had enjoyed the author's description of a piece of apparatus the applications of which were not sufficiently appreciated by distribution engineers. Tap-changing transformers were very reliable, but not suitable for all conditions. He had had several moving-coil regulators in use for several years and they had worked marvels. They made no noise at all and had not needed any attention whatever after three years' service. Distribution engineers did not appreciate the importance of steady voltage and its effects on output and revenue. A drop of 1.5 per cent. would affect revenue by 4 per cent. The addition of cooker load to a ¾-mile circuit, which previously did not vary by more than 2 V, reduced the voltage from 230 to 210 V. Balancing transformers would halve the drop, whereas with the coil regulator in use the voltage never fell below 230 V and never rose above 232 V. Such regulators were not a cure for all troubles, but they were certainly effective for long feeders not yet sufficiently loaded to merit the installation of transformers.

Mr. H. Diggle remarked that coil regulators with moving yokes had been described in German publications in 1908. The author's statement was a fair one, but his device had similar limitations to potentiometers. Many of the advantages claimed must be agreed with, but would the long limbs employed involve damage under short circuit conditions? It was sounder engineering to employ one conventional motor rather than eight or ten disc type machines all driving one gear wheel. Very rapid actuation of a regulator was not a real advantage. Tap-changing contact maintenance was not serious in the smaller sizes and smooth change was not really needed if the tapping steps were small enough.

Mr. R. C. Mildner said he had used coil regulators for several years under quite heavy loadings. The losses were reasonable and no more trouble had been experienced than one expected from transformers. They caused switching surges which were objectionable in connection with cable testing. Such surges might be rather more than 50 per cent. of the impressed voltage and could persist for 100 cycles (two seconds). Capacity loading might appreciably change the voltage curve, causing an initial rise followed by a recession.

Mr. N. E. S. Hill also spoke with reference to cable testing. He said the regulation was not good at low leading power factor; it was possible to get a high output voltage when the regulator was nearly "all out," and resonance phenomena might prevent more than half the transformer capacity being employable. They worked well when employed as chokes, but that was not the way they were intended to be used. They might also distort the voltage.

Mr. W. B. Cooper inquired whether coil regulators could be employed for heavy currents at low voltages, such as were needed for steel works furnaces, the currents being variable from zero to dead short-circuit values.

Mr. W. E. M. Eyres asked if coil regulators could be used for controlling cooker circuits. Why was a coil used instead of a solid sleeve, and why a sliding instead of a rotary coil?

Mr. G. B. D. Saw thought the paper contained a good deal of generalisation without the backing of mathematics or quantitative data, and so might be misleading. Operating time was simply a question of gear ratio. Induction regulators were not so terrible as the author seemed to imply; there were definite instances of 40 per cent. overload successfully carried. During earthquakes in Japan, when fault currents had entirely destroyed the overhead lines, the regulators were unharmed and had been reconnected to new lines with adjustment.

In reply, the author explained that the relative economics of moving-coil and tap-changing gear were difficult to ascertain on account of inter-relation with technical and manufacturing efficiencies, but there was no doubt about obtaining guarantees relative to losses or any other characteristic.

Industrial Thermal-storage.—How the storage of steam and hot water can ease the peak load problem to which industrial power plant is subject is concisely explained in the paper by Dr. F. G. Ritchie that was read before the INSTITUTE OF FUEL in London on February 10th. The several illustrative examples quoted include a steelworks which was recently equipped with a steam accumulator. The consequent elimination of steam pressure variation and the absorption of the peak loads reduced the steam consumption of the turbo-generator plant from 16.5 to 14.5 lb. per kWh produced, and enabled the power station to carry an additional load of between 1,000 and 1,500 kW, due to the more effective utilisation of the boiler plant. This saved the purchase of about 10 million kWh a year.

Thermostatic Cooker Control

WITH the increasing popularity of thermostatic control for domestic electric cookers there has grown a demand for thermostats to be fitted to existing cookers, and a number of manufacturers have introduced equipment to make this possible.

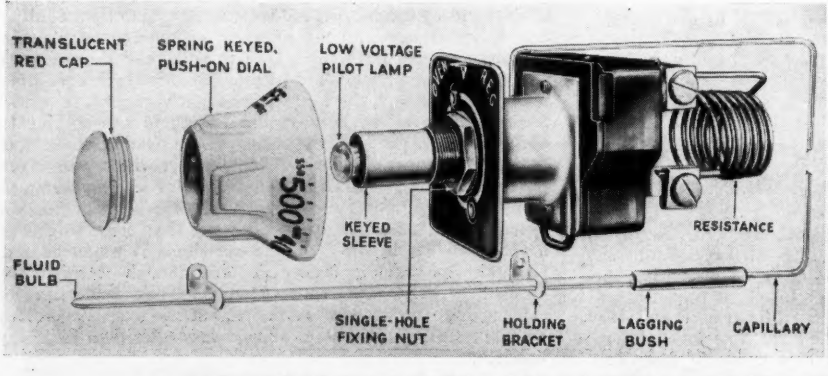
The latest introduction is the "Revostat," made by the Revo Electric Co., Ltd., Tipton, Staffs, which can easily be fitted to cookers on the mains in the home, since the device is interchangeable with the one-hole fixing three-heat switch.

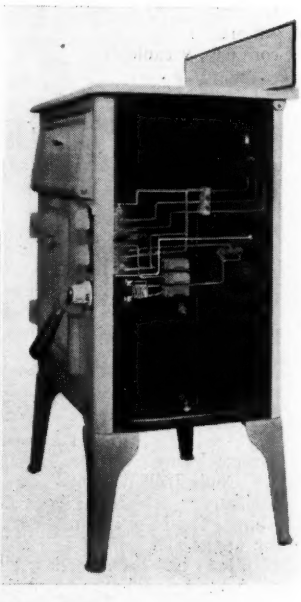
The thermostat is of the same general type as supplied by the company during the past two or three years; it operates on the fluid pressure principle, and its overall dimensions are rather less than those of a standard three-heat switch. The simplicity of fitting is worthy of mention. The ordinary three-heat switch is first removed, then the thermostat head is slid in through the hole in the switch frame; a cover plate is placed over the collar and the whole is secured by the single hole fixing nut; the operating knob is then slipped on to the head and fixing is completed.

The cover plate is provided to conceal existing indications on the switch panel and to provide a pointer mark for the new indicator. The only extra work entailed by a conversion, additional to the above, is drilling a small hole through the oven wall for insertion of the thermostat bulb, which is secured in position by two small clips. The capillary is then neatly disposed in the switch compartments and the wiring connection to the "Revostat" completed.

Among the outstanding features is the provision of a pilot light about the size of a penny in the actual knob. The 4-V pilot lamp behind the screwed translucent red cap can be renewed in a few moments. The pilot lamp is operated through a stout coil resistance at the back of the thermostat. The resistance is approximately 0.36 ohm for cooker ovens loaded from 1,400 to 2,000 W and the pressure applied to the 4-V pilot lamp is about 3 V, thus contributing to the long life of the lamp.

The energy dissipated by the resistance in the switchbox is approximately 23 W, which, from the point of view of temperature rise, is negligible. After fitting the "Revostat" to an existing "Revo" cooker it is necessary to calibrate the device, on site, this is done by means of an adjustable screw at the back of the thermostat, the operating knob being clearly marked with the temperature figures.





An "exploded" view of the "Revostat," and (right) a cooker fitted with the device

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Circulators and Thermostats

With reference to Mr. D. Picken's article on water heating in the ELECTRICAL REVIEW of January 28th, we should like to correct the theory put forward in his last paragraph, under the heading "Circulators and Thermostats," in connection with the length of the thermostat. Mr. Picken states that it is desirable for the length of the thermostat rod to be at least two-thirds of that of the heating element, to give control over the greater part of the cylinder.

This theory is, however, quite unfounded. Let us consider an ordinary household cylinder fitted with a vertical circulator at the top of the cylinder. The temperature gradient of the cylinder, and the amount of heat that can be stored in the cylinder, for a given top tank temperature are entirely independent of any thermostat. These two factors depend upon the size and shape of the container and the distribution of the winding in the heating elements.

Let us assume that four units have been placed into a standard household cylinder, that the top tank temperature is 170 deg. F., and that temperatures measured at 6 in. intervals from the top of the cylinder down its length each show a decrease of 5 deg. on the previous reading, *e.g.*, top of cylinder temperature:—170 deg. F.; 6 in. down, 165 deg. F.; 12 in. down, 160 deg. F.; 36 in. down, 140 deg. F. As we have already mentioned, this temperature gradient is entirely independent of any thermostat.

For the purpose of this argument, let us consider an external clamp-on type thermostat. If an instrument of this description was set at 170 deg. F. and clamped to the top of the cylinder the results given above would be obtained. If this thermostat was set at 165 deg. F. and clamped on at a point 6 in. down, these results would again be obtained. Similarly, the thermostat could be set at 140 deg. F. and clamped on 36 in. from the top of the cylinder. Now suppose a rod-type thermostat 12 in. in length is fitted vertically at the top of a cylinder. To obtain the results mentioned one only has to set this instrument to cut out at the average temperature of the water in the top 12 in. of the cylinder *i.e.*, 165 deg. F.

In short, a thermostat of any length may be used in a circulator with equally good results, providing the thermostat is set in proportion to its length. This theory of Mr. Picken's is a common one. We trust that this letter will enable him to modify it.

SANTON, LTD.
J. C. Sanders, A.M.I.E.E.,
Newport, Mon, *February 7th.* *Works Manager.*

Screened Cables in Australia

Although British Standard Specification No. 480/1933 covers "screened" cables for 10-kV and 20-kV working pressures, many distribution engineers seem not fully alive to the advantages of this type. It is, however, significant that tenders recently issued by the Newcastle City Council and Brisbane City Council, two of the largest electricity undertakings in Australia, specified 11-kV screened cable, and one large industrial concern in New South Wales has purchased 0.4 sq. in. three-core 6.6-kV cable of the same type.

The history of the screened cable is interesting. In 1914, when Martin Hochstädter introduced his "H" principle of screening the individual cores of paper-insulated cables, cable technique was possibly given its greatest boost, although the intervention of the war retarded its ultimately widespread adoption. Hochstädter's screened cable is the precursor of the modern "super-tension" cable, for it overcame the disadvantages of the belted cable operating above 20 kV.

For years the trend has been towards the application of screening to the highest voltages. Scant attention was paid to its possibilities at voltages below 20 kV. In 1934 the President of the Institution of Electrical Engineers, Mr. P. V. Hunter, in his address, drew attention to the "rural" cable, popularised on the Continent and being introduced into England by British makers to meet the competition of overhead lines in rural distribution. He pointed out that by employing modern "super-tension" methods and materials for the lower voltages reduced thickness of dielectric became permissible. There is no reason why 11-kV cables should not be designed to operate at the same stress as, for example, 66-kV cables, and yet the practice of keeping down the stress, the lower the voltage, has long persisted. The argument regarding the possibility of mechanical damage to cables having reduced thickness applies, if at all, only to low-voltage cables. Hochstädter's screening principle has made the "rural" cable possible, and despite the reduction in dielectric thickness an improved factor of safety in service is obtained as evidenced by the time-voltage characteristics.

The advantages claimed for 11-kV cable having individually screened cores are as follows:—

1. Increase in current rating by from 8 to 12 per cent. due to more efficient conduction of heat and higher permissible conductor temperature. 2. Increased factor of safety due to radial and uniform distribution of stress; the wormings (the weakest part electrically) are not under stress and there are no tangential stresses. 3. No core-to-core failures, since the screening keeps the outer layer of the insulation of each core at earth potential.

Jointing of 11-kV screened-type cable differs but little from the methods used for jointing belted cable. As it is unwise to terminate the screens abruptly owing to concentration of stress, the favoured practice is to taper the cores, build up the insulation with impregnated paper tapes to about 1.6 times the normal core insulation and carry the metallised screen over the built-up cores. The metallisation ensures that the stresses in the joint are radial and uniform. The lead sleeve is filled with a fairly viscous high-grade insulating compound. A screened joint takes two hours longer to make, but the increased efficiency more than offsets the additional cost. The method calls for no specialised training beyond practice by a skilled jointer in applying the paper tapes.

H. R. HALLIDAY,
Resident Engineer,
Sydney, *January 18th.* Enfield Cable Works (A/sia) Pty.

Refusal to Connect

I should much appreciate your readers' views on the following case:—

I recently carried out for my firm the wiring of ten three-phase, 400-V fans for steam radiation. The total load, with all working, was under 3 A. The wiring was in screwed conduit, and triple-pole switches with fuses to control each fan were fixed. These were all looped and a main switch with fuses fixed at the mains end.

The local supply authority, a municipality a few miles from Leeds, has just refused to connect the installation on the ground that these fans should have been split into two circuits, notwithstanding that each fan has its own switch and fuses. The job has been carried out according to the I.E.E. Rules, and the insulation test was perfect. Is the undertaking justified in refusing to connect the installation? C. J. GUMMERSON.

Leeds, *February 5th.*

Railways and Speed

In Dr. Teago's admirable article in the ELECTRICAL REVIEW of January 28th a few inaccuracies appear, which I hope you will allow me to point out.

The "Silver Jubilee" train of the L.N.E.R. weighs 220 tons tare and averages 70.4 m.p.h. from Darlington to King's Cross in normal running and has touched a speed of 112¼ m.p.h. on test, but speeds above 90 m.p.h. are discouraged as a general rule, except to make up lost time, though 90 m.p.h. is often touched daily on certain favourable sections. I understand that the "Coronation" train of the L.N.E.R. is timed similarly, but has two more coaches and weighs 312 tons tare, though one third class coach is to be added to the "Silver Jubilee"—these trains are hauled by three-cylinder streamlined locomotives of the 4-6-2 type.

The "Coronation Scot" train of the L.M.S. does not run to Glasgow daily at 61.8 m.p.h. This was the speed of the test train on November 16th, 1936, with a "Princess Royal" 4-6-2 locomotive—*not* streamlined. The "Coronation Scot" is run by streamlined 4-6-2 locomotives differing in details only from the "Princess Royal" class, but based on that design and having actually a very slightly less tractive effort—(300 lb.) 40,000 lb. instead of 40,300—these are four-cylinder locos, and not three-cylinder as Dr. Teago states, though the "Jubilee" class of 4-6-0 L.M.S. engines have three cylinders, but are not streamlined and do not run on the "Coronation Scot" at any time.

As to the Southern Railway trains on the Portsmouth route, which he describes as having "disappointed some electrification enthusiasts," I would point out that in the ordinary time-table—weekdays and Sundays—*no* train (see "Bradshaw") runs non-stop between Waterloo and Portsmouth Harbour—all these "fast" trains include Guildford and Haslemere in both directions, while the "road" is by no means a galloping ground below Guildford. I can testify

personally, however, to passing Woking, 24 miles, in 24 minutes on many occasions, though the steam-train schedule, *e.g.*, "Bournemouth Limited," is 29½ minutes to passing Woking. This puts up the average of the Portsmouth trains between stops considerably. These "electric eels" are excellent for their job, as anyone trying them will find.

One further mistake—possibly a "printer's error"—in table 2, under "type of running rail," these are described on English lines as "Standard Bulb Head"—"Bull Head" is the correct name, as I have known it for many years.

It so happens that though I am a medical man, I am a railway enthusiast and student since early days, and, as a radiologist in practice for 24 years, I am an electrical enthusiast and student of electrical engineering as well. We all want to "load the grid" and see the best man win, but the "steam streamliner" will not easily be ousted for really long-distance runs for it runs most economically, as the tests have proved, while large-scale electrification would cost millions which could be saved and the vulnerability of the grid and electrified railways must be considered seriously as regards a national emergency.

I would suggest, in all humility to Dr. Teago, a perusal of the *Railway Magazine* for December, 1936, and January, 1937—these give actual runs and loads with steam on the L.N.E.R. and L.M.S.

D. D. MALPAS,
M.R.C.S. Eng., L.R.C.P. Lond., Companion I.E.E.

Bournemouth, *February 1st.*

There are one or two minor errors in Dr. Teago's article. The coal consumption when working the "Coronation Scot" express is given as 1½ tons per hour; this, amounting as it does to 54.5 lb. per mile, is far too high. "Standard Pacific No. 6201," when working the experimental runs upon which the "Coronation Scot" schedule was based, consumed 45.8 lb. of Grimesthorpe coal per mile (mean for the down and up journeys). It is probable that some 70-75 per cent. of Dr. Teago's figure would have close approximation to the one obtaining in practice.

There has been published little matter that would demonstrate the capacity of Mr. Stanier's "Pacific" class, but an engine that is capable of hauling 500 trailing tons at an average speed of 53 m.p.h., from Lancaster to Shap Summit, will work any express schedule in the country with manifest ease. Several cases have been within my notice wherein there has been sustained between these two points 1,500 draw-bar h.p. and 2,000 indicated h.p. That such rates of working impose no undue strain on the fireman is clear from the fact that on the fastest run the engine was opened out to some purpose on the final stretch—from Tebay onwards—and this after an exceptionally fast run from Preston. Monsieur Bachellery's figure of 2,500 sustained draw-bar h.p. is an optimum one, indeed, and one cannot readily recall any French schedule that, even in emergency conditions, would make such a demand.

Under the heading "Tractive Effort" far-reaching statements are made, yet without making it perfectly clear just what the author has in mind. Has he, for instance, as basis for his ideas, the report of the Bridge Stress Committee, or the remarks contained in the opening chapters of the late Mr. Twinberrow's paper on "Electric Locomotives"? Perhaps he has access to data that is not available to others. It would appear, however, that the statement is not quite so searching, and fails to consider the lack of riding similarity of the two types of tractor.

It is not without disappointment that one notices that the power-weight ratio (whatever it means in this case) has been defined as the quotient of the indicated h.p. by the weight of engine and tender in working order; the utility of this ratio, except that in practised hands it might enable comparison of almost similar engines, is not at all easy to see. Hobart, I think, was amongst the pioneers of this tabular method of engineering, but, in general, he contrived to compare things that were comparable.

R. SIDNEY BLACKLEDGE.

Rochdale, *February 7th.*

[Dr. Teago writes:—"In reply to the minor points raised by Dr. Malpas and Mr. Blackledge I would say that part of my purpose was to select some outstanding features of steam loco. performance rather than to give a list of the many spectacular runs which have been made. I am still of the opinion that the 'Coronation Scot' is daily timed to cover the Glasgow-London run in 6½ hours at an average speed of 61.8 m.p.h. My coal consumption figure of 'about 1½ tons' per hour may be high, but not sufficiently high to rule out the 'physical endurance' point and my inference that electric tractors are not limited in this manner. I quite realise the difficulty of comparing steam and electric tractors and even of comparing electric tractors, but comparisons must be made since tractors are tractors after all and the figures involved are approximately in the ratio of 2 to 1. The point about the number of cylinders is real and I admit that the 'Coronation Scot' has four."]

The American Domestic Appliance Market

Large sales during the past year

A REVIEW of the sales of domestic electrical appliances in the United States during 1937 and of future prospects is contained in the January issue of *Electrical Merchandising*. Dealing with washing machines, our contemporary states that owing to the fall in sales in the last quarter of the year the unit sales for the whole year were lower than in 1936, the total number of electric washing machines sold being 1,479,660, as compared with 1,528,585 in the preceding year. However, due to the increase in average prices throughout the year the total retail value ($106,150,808) was 5.15 per cent. higher. The cause of the decline in sales of washers was due to the same reason that saw sales of other appliances below anticipation for the last quarter—economic conditions and the decrease in employment. Part-exchange and replacement business increased in importance during the year, and as the washer market has now reached 55.50 per cent. of the wired homes in the country, the part-exchange problem will increase. From reports received, however, our contemporary is of opinion that washers will probably show an increase in sales for the coming year.

Sales of electric ironing machines receded by 1 per cent. in 1937, the number being 178,478, as compared with 180,281 in 1936. The value, however, rose from $10,384,185 to $12,493,460. In spite of a slump in the last quarter, domestic refrigerators again established records both in unit sales and value. Unit sales for the domestic market only reached a total of 2,320,000. The total production of refrigerators was 2,520,000, of which 200,000 were sold for export. The sales in the United States were valued at $401,360,000, an increase in unit sales of 11.56 per cent. as compared with 1936, and of 17.68 per cent. in value. The average price rose from $164 to $173.

This increase in the average price was due less to higher prices on individual sizes than to the fact that the higher proportion of sales was made in refrigerators of 6 cu. ft. and larger. Saturation is now 49.4 per cent., which indicates that the 1938 market will have to seek new customers, perhaps new classes of customers, but in view of the popularity of the electric refrigerator it is anticipated that the current year's sales will at least equal the figures for 1937.

Electric ranges show a large increase as compared with 1936, and it is confidently forecast that an equally great increase will be shown for 1938. Ranges sold in 1937 totalled 405,000, with a total value of $54,270,000, as against 318,000 and $41,413,140, respectively, in 1936. Pioneered by the utility companies, up to 1931 the power companies made 80 per cent. of all range sales, but it is generally agreed that in 1937 dealers made approximately 50 per cent. of the total. Informed estimates for 1938 look toward the sale of at least 500,000 ranges for the year.

Being in the pioneer stage of development in most sections of the country, water heaters are largely the responsibility of the power company. Sales in 1937 were approximately 115,000 with a retail value of $9,500,000, the figures for 1936 being 104,000 and $7,609,680, respectively. The National Water Heater Council will engage in the promotion of electric water heating to the trade and to the public during the current year, and this cannot fail to have a favourable effect on sales.

There was a large increase in the sales of vacuum cleaners, last year's figures showing that 1,313,000 floor models with a retail value of $71,230,250, and 427,000 hand models, valued at $5,871,250, were sold.

Small appliance sales in all classifications showed increases during 1937. These classifications included electric clocks, automatic and non-automatic irons, metal and glass coffee-makers, toasters, hot-plates, cookers and casseroles, heaters and radiators, heating pads, and a new-comer to the field, dry shavers. For the entire group, exclusive of mixers and fans, the sales were 13,905,250 units at a retail value of $86,671,895. Leaders of the group were electric clocks, irons and dry shavers. The current year should see a continued improvement in the small appliance field.

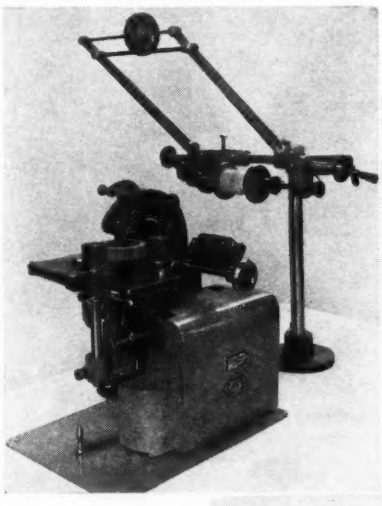
The total sale of incandescent electric lamps of all types during 1937 was 955,000,000, with a retail value of $154,600,000. This compares with 883,100,000, valued at $145,500,000 in 1936. The total for 1937 was made up as follows:—Residential, 193,600,000 ($28,400,000); commercial, 228,700,000 ($57,300,000); industrial, 92,700,000 ($25,300,000); and miniature, 440,000,000 ($43,600,000).

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Winding Small Coils

The machine supplied by FRANK WHITELEGG, 34, York Way, King's Cross, London, N.1, for winding toroidal or Pupin coils has been redesigned. It is supplied in various sizes depending upon the diameter of the coils and the gauge of wires required. The wire is taken from a standard bobbin holder and wound on to a magazine or shuttle controlled by a brake that can be adjusted to give the necessary tension. The coil being wound is revolved by means of rollers. Shuttles of many different sizes can be supplied, the smallest dealing with holes ⅜ in. in diameter. The machine can be provided with a single pulley for direct drive or may be operated by pinion through a special gear drive. It is supplied for single-layer winding or, with an alteration of the traverse, for multiple-layer. A device can also be fitted for either 90 or 180-deg. segment.



Automatic Star-Delta Starters

Designed for local or remote actuation, the latest automatic star-delta starters of the E.M.B. Co., LTD., West Bromwich, will control motors of from 20 to 150 h.p. at 440 V.

The contactor magnet is of high permeability sheet steel laminations arranged for three-point mounting. The copper contacts are mounted on a micanised square bar and magnetic blow-outs are fitted with arc shields of a special material. The rocking shaft complete with armature and moving contacts can be removed from the panel without disturbing the magnet and fixed contacts.

Magnetic overloads of the oil dash-pot type are fitted in which both the setting and time lags are adjustable. The change-over relay is of the oil dash-pot type embodying a quick action break and make of the silver tipped contact surfaces.

The closing of the line contactors operates the timing relay which controls the opening of the star contactor and the closing of the delta contactor. The mechanical interlock prevents the star contactor operating when the delta contactor is closed. The panel can be arranged for pedal switch, push-button, pressure switch or float switch operation.

Small Circuit-breakers

The combined circuit-breaker and plug socket of A.E.W., LTD., Imperial Works, High Street, Edgware, which was first described in our issue of April 12th, 1935, is now available with delayed thermal action for the protection and control of electric motors. Although it permits the momentary heavy starting current it operates if the overload time exceeds the safety factor of the motor. For small and medium-sized portable tools breakers adjustable between 1 and 3 A are available. For washing machines, refrigerators, &c., where ¼-h.p. motors are used, there is a model which is adjustable between 2½ and 5 A.

Changes have been made in the appearance of the "Heatrae" convector heaters, and the illustration on the right shows the latest type in three sizes rated at 1-, 2- and 3-kW

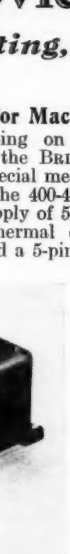
Lighting Unit for Machine Tools

For low-voltage local lighting on machine tools a 45-VA transformer put forward by the BRITISH THOMSON-HOUSTON Co., LTD., Rugby, obviates special medium-voltage circuits, as it is designed to operate off the 400-440-V 3.c. motor system. It provides a safe lighting supply of 50 V in conjunction with a double-pole switch with thermal over-current trip, two single-pole porcelain fuses, and a 5-pin socket plug, the whole being accommodated in a sheet-steel box only 7¾ in. wide, 7 in. high and 5¼ in. deep.

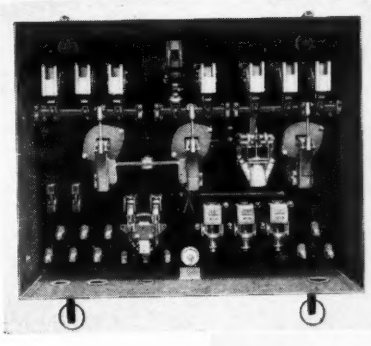
With the exception of the shrouded 5-pin connection socket all the components are secured to the cast-iron front panel, with packed joint between the panel and the case to render the unit dust-tight and weatherproof. The transformer is air-cooled and has separate input and output windings, effectively insulated from each other. An earthed metal screen between the two windings is a safety precaution which renders it impossible for the low-voltage lighting circuit to make contact with the supply side. The thermal over-current trip contacts are of silver and open and close with a definite snap-action; the switch mechanism is trip-free, which makes it impossible to hold the switch closed under fault conditions. The thermal over-current device comprises two small parts normally held together by a low-melting-point alloy, which melts under overload conditions and trips the switch.

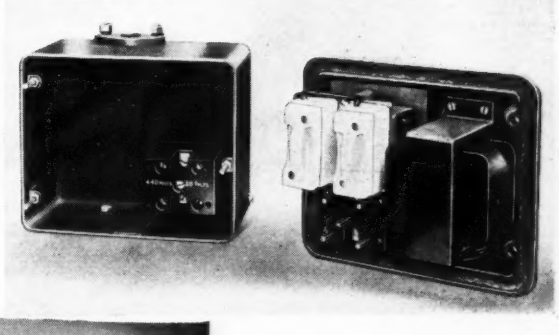
As soon as the metal cools and union is again established the device is reset by turning the switch-knob to the "off" position.

Two porcelain-handle, 500-V, single-pole rewirable fuses protect the primary side of the transformer. The 5-pin plug and socket is of the solid pin, plunger socket type. When withdrawing the cover the earth pin remains in full contact until the live pins are clear.



The A.E.W. circuit-breaker (above), and (left) the "Whitelegg" coil-winding machine





Left. The E.M.B. star-delta starter. Below: The B.T.H. safety lighting set with cover withdrawn and all equipment accessible

The low-priced projectors which GRAHAM FARISH, LTD., 153, Mason's Hill, Bromley, Kent, have popularised for outdoor floodlighting have now been made available for industrial use, shop windows, spotlights, etc.

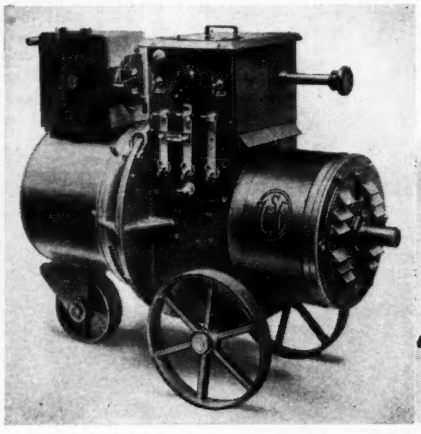
They are finished in green stoved enamel and have rustless reflectors. Two types of fitting are available for screwing direct to conduit or to walls or conduit boxes.

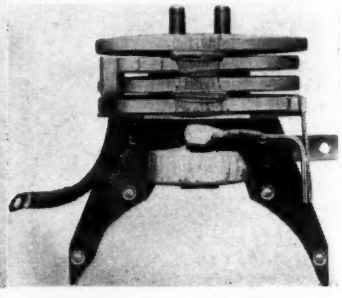
E

Arc Welding

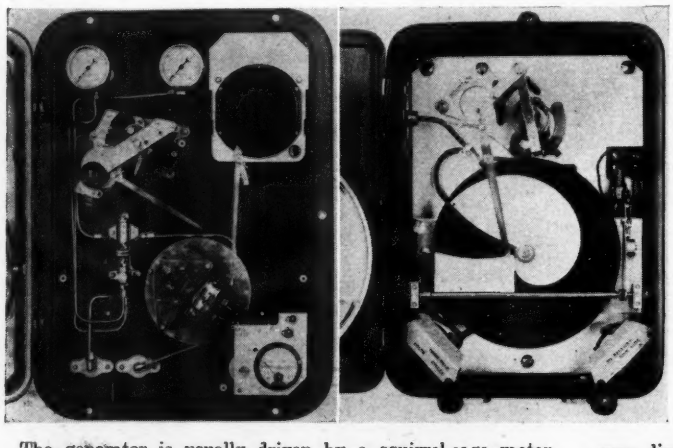
A new type of welding generator has been introduced by LAURENCE, SCOTT & ELECTROMOTORS, LTD., Norwich, in which regulation is by magnetic saturation and leakage. The advantages claimed are that the method avoids working with the magnetic circuit in an unstable condition, thus securing positive and fine control of current and freedom from reversal of polarity, ensures low open-circuit voltage and rapid voltage recovery after short circuit, and entails easy cleaning up.

The generator consists of a rectangular welded-steel frame of relatively thin section to which are bolted the two main poles, incorporating commutating poles. Horns on the main poles provide magnetic leakage paths to the side of the frame. The field windings consist of two series coils (one on each main pole) connected in parallel. The regulating resistance is in series with the bottom coil and with all resistance in, almost all the current flows through the top coil, so that the output is limited by magnetic saturation and leakage to 40 A (on the high current setting of the regulator). With all resistance out the maximum output of 300 A for intermittent hand welding at 25 to 30 arc volts is obtained. For currents below 40 A two links in the regulator connect the top instead of the bottom coil in series with the resistance, enabling welding to be carried out with currents as low as 12 A. The portable resistance, on which one sliding regulator gives coarse and fine adjustment of current, can be operated from the work. A polarity reversing switch is provided.





Standard "K-S" welding motor-generator of the transportable type, a.c. motor driven. The regulator is detachable for remote control. On the right is the field coil and pole piece, showing the rigidity of the traction type coils and ample provision for cooling and the shape of the pole "horns" which provide magnetic leakage paths to the frame



The generator is usually driven by a squirrel-cage motor consisting of a rotor keyed to an extension of the shaft and a stator spigoted to the driving end bracket. The set, which weighs 900 lb., is mounted on wheels. When welding with currents up to 100 A the star-delta switch may be kept in the star position, improving efficiency and power factor at lighter loads.

For continuous hand welding the output is 225 A at 25 to 30 arc volts and against resistance load for six hours 160 A at 30 V. Two or more sets operating in parallel share the load equally without exact setting of the regulators.

Portable and stationary sets are made for a.c. and d.c. drives or combined with petrol or Diesel engines, or for belt drives.

A Power Screwdriver

One of the latest introductions into this country by GASTON E. MARBAIX, LTD., 22, Carlisle Place, London, S.W.1, is a magazine feed power screwdriver.

It has an adjustable friction clutch for driving screws to any desired tension; the screws are always in sight of the operator and highly plated or polished screws can be driven without marring the heads. Holding fingers grip the screws until one or two threads have engaged the threaded hole. The bit rotates by drift only when entering the screw slot. Steel or brass machine or wood screws can be used in the machine, the time taken for driving a screw being from 1½ to 2 secs.

The floor space occupied is 2 ft. by 3 ft. and the weight 350 lb. The spindle speed depends upon the motor speed and motor pulley diameter, *i.e.*, when the motor pulley speed is 1,750 r.p.m. and the diameter of the motor pulley 2½ in., the spindle speed is 1,450 r.p.m. Both 9- and 12-in. hoppers can be fitted of the helical or barrel type.

Industrial Instrument Developments

Since opening its new factory at Brent Crescent, Park Royal, about twelve months ago, BRISTOL'S INSTRUMENT CO., LTD., has added considerably to its range of recording, controlling and indicating instruments for industrial purposes.

One of the most interesting of the new products is the "Pyromaster," a round chart direct marking instrument, employing the potentiometer method of measuring thermocouple electromotive force in terms of temperature. It is designed to operate under the most exacting conditions and is unaffected by vibration. Except when a change of temperature occurs there are no moving parts. The operating mechanism is made up of five separate easily replaceable parts.

Bristol's "Pyromaster" potentiometer recording controller and the "Metameter" transmitting unit

In addition to being available as a pyrometer, tachometer, resistance thermometer, temperature controller (range 0-3,000 deg. F.) or millivoltmeter, the "Pyromaster" can be supplied as an electric controller to operate electric motorised valves, relays and contactor equipment.

For remote measurement and recording of pressure, liquid level, temperature, flow, or motion, the "Metameter" electric impulse system comprises self-contained transmitter and receiver units connected by two wires. Any type and frequency of current may be used for transmitting the impulses. Except for long distances (over, say, 250 miles) no relays are necessary. Power consumption is very small and the system is unaffected by variation in voltage or line conditions. No exposed contacts and no vacuum tubes are used.

By using proper filter or balancing circuits the impulses may be superimposed upon, or co-ordinated with, communication or other circuits, with the minimisation or possible elimination of the cost of a separate line for the "Metameter." By means of a simple auxiliary apparatus two "Metameter" systems can be operated over a common two-wire circuit. The receiver and transmitter do not require a common power supply, and where no power is available at the point of measurement the transmitter motor can be operated by power over the "Metameter" line. Should the supply fail the system is self-restoring.

In addition to the above new instruments, other developments include the new "Ampliset" free vane controller, and modified and improved cycle controllers, and low range draught and pressure recorders and controllers.

Two new products: A small reading lamp by Goodliffe Electric Supplies, Ltd., and the "Handy" 6-in. bench grinder sold by Gordon Equipments, Ltd. It is fitted with coarse and fine 6 in. by ½ in. wheels

New Books

Elementary Theory of Operational Mathematics. By E. STEPHENS. Pp. 313. McGraw-Hill Publishing Co., Ltd. Price 21s.

Operational mathematics, the subject of this book, is that important branch of mathematical technique in which symbols of operation are, within appropriate limits, treated algebraically. The germ of the operational calculus is found in Leibnitz's index notation for repeated differentiation, and its most elementary application is suggested by the fact that the harmonic function is reproduced with a change of sign, at the second differentiation. The operational calculus was exploited with great power by Oliver Heaviside, and elementary students were introduced to this technique by Perry, in his once popular "Calculus for Engineers."

Since Heaviside's work operational methods have been largely developed and put on a firm theoretical basis by mathematicians, and in the book under notice Professor Stephens gives a very good account and explanation of modern operational technique and its application to electrical problems. After three preliminary chapters covering ground more or less familiar to the student the author devotes two important chapters, on determinants and matrices, to the algebra of operational methods. The rest of the book deals with partial differential equations, solutions in series, and a consideration of initial and terminal conditions. The appendices incorporate full lists of formulæ and an interesting historical survey.

This outstanding book is essentially one for the electrical student with decided mathematical ability, the style is formal and concise, and, in spite of its title, it must be classed as a treatise on a difficult branch of the higher mathematics.

Alternating Current Electrical Engineering. By P. KEMP. Pp. 611; figs. 421. Macmillan & Co., Ltd. Price 15s.

As a.c. electrical engineering may be said to cover almost the entire field of the generation, distribution and utilisation of electrical energy, it becomes increasingly difficult to cover this vast field adequately within the covers of a single volume. The author has, nevertheless, done this well.

Since the first edition of this work appeared in 1918 it has been revised and enlarged from time to time until to-day the fifth edition extends beyond 600 pages. The call for successive editions at regular intervals of four or five years on a subject that is always widening its scope shows that the author has succeeded in keeping his work abreast of developments as they occur.

The original plan of adhering to general principles rather than describing particular types of machinery and apparatus has still been followed, with the result that the student commencing with the most rudimentary knowledge of electricity and magnetism, assisted with some mathematical knowledge up to and including elementary calculus, can work his way steadily through this book, dealing first with the fundamental principles of alternating currents, passing thence to alternators, the various types of a.c. motors, transformers, convertors and rectifiers, and also the various types of instrument used in measuring and recording the performance of all these.

The ground covered, including examples at the end of each chapter, enables the volume to be used as a textbook for those preparing for the "Ordinary" and "Higher" National Certificates in Electrical Engineering, and it is also suitable for students preparing for the B.Sc. (Engineering) degree. But it will also be useful to every electrical engineer who is desirous of keeping in touch with the developments which are taking place in his profession.

Statistical Year Book of the World Power Conference, No. 2. Data on resources and annual statistics for about sixty countries during 1934 and 1935 with, in many cases, world totals. Edited, with an introduction and explanatory text, by F. BROWN. London: World Power Conference. £1. Pp. 132.

Statistics on coke and manufactured gas are included for the first time in this very comprehensive year book.

A section of twenty-two pages is allocated to Electricity, and includes particulars of production and distribution for specified purposes by industrial establishments as well as authorised undertakings. Much of the information presented is said not to have been published before in any country.

The J. and P. Transformer Book. By S. A. STIGANT and H. M. LACEY. Pp. 916; figs. 541. Johnson & Phillips, Ltd. Price 12s. 6d. (postage 9d.).

Since its first appearance in 1925 this work has become well established as a standard technical handbook that covers in a most able manner the fields of theory and practice, design and operation of static transformers. In this, the seventh, edition little alteration has been made in the logical and convenient general arrangement of earlier editions, except for the inclusion of an appendix co-ordinating the mathematical and vectorial methods in a symmetrical component study of earth faults on transformers in parallel, including notes on zero-phase-sequence impedances and networks.

The outlook here, as throughout, is essentially practical, however. Certain changes are due to the issue of B.S.S. 171 since the last edition of this book, mainly with reference to ambient temperatures and overloads, the limit of average winding temperature rise ascertained by change of resistance and tolerances on electrical performance guarantees. Another modification relates to the effect of the Electricity Commissioners' Regulations of 1937 on neutral earthing.

The application of on-load tap-changing to smaller transformers, the greater use of the continuous-disc winding, and the availability of flame-proof transformers in small sizes have entailed the introduction of further new matter, while minor, though important, modifications in conformity with modern ideas have been made in the sections relating to transients in transformer windings.

Change-over of D.C. Supply System to the Standard System of A.C. Distribution. By S. J. PATMORE. Pp. 67; figs. 18. Sir Isaac Pitman & Sons, Ltd. Price 3s. 6d.

This little book forms a useful guide to supply engineers entering the intricacies of change-over work for the first time. The information given is sound, but the author attempts to cover the whole subject within the space of 67 small pages, and it follows that some angles of the work receive very scanty treatment. In particular, insufficient emphasis is placed on the many snags and pitfalls which occur, however carefully the work has been planned in advance.

Two chapters, dealing with a.c. distribution in general and finance, seem to be rather outside the scope of the book from the practical engineer's point of view. The chapter on legal procedure, with appendices setting out the statutory requirements and standard notice forms, &c., is of particular value. Reference is made to the matter of meter testing in some detail, but very little space is given to the special organisation needed for changing large batches of meters to a prearranged programme.

A short chapter deals with the testing of consumers' installations, and more might be made of the problems which undertakers are often up against in dealing with installations which are found to be defective, especially in the light of the extra protection given to the consumer under the 1937 Regulations against summary disconnection by a supply authority.

In the chapter dealing with consumers' apparatus the author rightly emphasises the advantages of carrying out this part of the work by direct labour and the conversion of wireless sets, domestic equipment and other small apparatus is dealt with in a clear and concise manner. The section dealing with motors is too brief and conveys little idea of what is involved in changing over an industrial network containing moderate-sized motors where such details as motor pulleys, special drives and fixings and speed control often need individual consideration.

A useful addition to the book would be some statistics to show representative costs of conversion based on particular kinds of apparatus or number of consumers, also the number of staff required and transport necessary for a projected rate of change-over.

Shorter Notices

"Steam Turbine Operation," by W. J. Kearton (Sir Isaac Pitman & Sons, Ltd., London, price 12s. 6d.) has now reached its third edition, which differs only slightly from the preceding one. The chapter on regenerative feed-heating has been enlarged by the inclusion of some explanatory matter and notes on the construction of feed-water heaters and evaporators for make-up feed water.

"National Electrical Code Handbook," by A. L. Abbott. Pp. 561, illus. London: McGraw-Hill Publishing Co., Ltd. Price 18s. The fourth edition of this work, based on the 1937 Code is now available. The lucidity of the text and excellent diagrammatical illustrations permit an easy grasp of the code to be obtained, but both the Code itself and the practice are in the main applicable only to American conditions.

The fact that it has now reached the 13th edition is sufficient evidence of the usefulness of "Hints and Tips for Motor Cyclists" (pp. 202, Iliffe & Sons. 2s.). It contains 721 useful tips in connection with the maintenance of motor cycles (much applying to cars also), and should prove a valuable handbook to the travelling wireman and mains engineer.

"The British Journal Photographic Almanac, 1938." Edited by A. J. Dalladay (748 pp.). London: Henry Greenwood and Co., Ltd. Price 2s. net.—This compendious annual as usual contains a number of useful articles on various aspects of photography; many illustrations; and a vast amount of information.

"Vibration Problems in Engineering," by S. Timoshenko. Pp. 470; figs. 229. Constable & Co. Price 24s.

Resistance Welding

A well illustrated technical paper on resistance welding in the metal manufacturing industries, by Dr. F. R. Hensel, which was recently presented at the Midlands Branch of the Institute of Welding, has been reprinted for free distribution by Mallory Metallurgical Products, Ltd., Waddon Factory Estate, Croydon, Surrey. The paper contains examples of typical installations and production results, which are claimed to be enhanced by the use of dies and electrode materials made of the very hard high conductivity alloys supplied by this company.

In the Courts

A Fitter's Claim for Damages

IN the King's Bench Division, on February 3rd, the hearing was commenced before Mr. Justice Hawke and a common jury of an action brought by Mr. Wilfred Edward Penney, an engineer's fitter, Greenwich, against the West Kent Electric Co., Ltd., to recover damages for personal injuries received owing to the alleged negligence of the defendants and breach of their statutory duties.

Mr. Penney's case was that he without any special electrical knowledge entered the service of the defendant company in May, 1936, as an engineer's fitter and on October 28th, 1936, had commenced to carry out certain work at an electrical sub-station owned or under the control of the defendants at Hawley Paper Mills, Dartford. The equipment included a 10,000-V cubicle type switchboard comprising one transformer equipment and two feeder equipments. The plaintiff alleged that the sub-station was a place to which the regulations made under the Factory and Workshops Act, 1901, applied, and was subject to the regulations made by the Electricity Commissioners pursuant to the Electricity (Supply) Acts, 1882 to 1933.

On October 29th the plaintiff returned to the sub-station for the purpose of completing some work, and whilst removing some metal filings from a cubicle in which a switchboard was contained he came into contact with some live conductors, the doors of which were open, and received a shock which rendered him unconscious and which, according to medical evidence, would cause him permanently to lose the use of his arms and render him unable to do any work again.

The plaintiff alleged that before commencing work on October 29th the defendants' works manager said that it was "all right for him to go ahead," and his case was that the defendants were negligent in allowing or permitting the switchboard to be alive whilst he was working upon it and in failing to take precautions to prevent an accident.

The defendants denied liability and that they were guilty of negligence or breach of statutory duty, and they further pleaded that the plaintiff's injuries were caused or contributed to by his own negligence.

Mr. Rewcastle, K.C., for the plaintiff, said that his client, having no technical knowledge, had been sent to the place in question without having somebody in charge who did know something about technical matters. In his submission the sub-station was clearly a "factory" within the meaning of Section 149 of the Factory and Workshops Act, 1901.

Mr. Roland Oliver, K.C., for the defendants, said he admitted that the sub-station was a "factory" to which Section 149 applied and that the regulations applied to the defendant company but that they were not effective as applicable to the facts of the present case. Defendants' case was that they had complied with the regulations and alternatively they alleged that the plaintiff had himself been guilty of contributory negligence. The question was whether under the regulations the plaintiff, who was an engineer's fitter, was a "competent person" acting under the supervision of a competent person. He agreed that "competent" must mean competent in matters appertaining to electrical danger.

The plaintiff was entitled to receive compensation under the provisions of the Workmen's Compensation Acts, but he was now applying for damages on the ground that the defendants had done something wrong which defendants denied. He (counsel) understood that the defendants could not rely upon a plea of "common employment" if there was a breach of statutory duty, but he could rely on plaintiff's contributory negligence.

Mr. Penney gave evidence in support of his case, and in cross-examination by Mr. Oliver admitted that to be an engineer's fitter it was necessary to have a fairly good education and to have a good deal of common sense. At the time of the accident he was earning nearly £4 a week. He had knowledge that electricity might be a dangerous thing and that if one grasped an electrical conductor it might have serious consequences.

On February 4th Mr. Bryan Donkin, an electrical engineer, gave technical evidence in support of the plaintiffs' case but admitted that the Electricity Supply Regulations did not apply if it was held that the sub-station was not part of the consumers' premises.

Mr. Oliver, in opening the case for the defendants, maintained that they had not been guilty of negligence. He thought that the jury would have no doubt when they had heard the evidence for the defence that the plaintiff had brought upon himself the injuries from which he suffered.

Mr. F. H. Cowlard, general foreman in the employment of the defendant company, gave evidence that at the time in question the defendants had three fitters, the plaintiff being one of them, and he (witness) had instructed them orally and by demonstration what they had to do to avoid danger. He said that the company had about 100 sub-stations and that people only went there for the purpose of doing some particular job and for some particular reason. On October 28th he told and demonstrated to the plaintiff and the other fitters what they had to do for their safety and they expressed their satisfaction with the instructions. He agreed that the plaintiff knew very little about electricity but he considered he was competent to do the work he was instructed to do.

Mr. E. Woodhurst, a jointer, gave corroborative evidence.

Sir Duncan Watson, M.I.E.E., said that he was familiar with sub-stations of the character of the one in question and in his experience it was not the rule in such a sub-station to have the cubicles under lock and key except in places to which the public might have access. In his view it was not practicable to keep a foreman engaged in the constant supervision of all the workpeople.

On February 7th, when the hearing was resumed, Mr. Rewcastle announced that a settlement had been arrived at. He said that during the week-end he had had certain discussions with Counsel for the plaintiff and had ascertained that the reason why the defendants were fighting the case so strongly was that they felt they must contest the allegation that they were in neglect of their statutory duty. On the basis of a verdict being given on the grounds of common law negligence they had been able to dispose of the matter on the terms that the plaintiff would receive from the defendants £5,000 and costs.

Mr. Oliver said he was glad the case had come to an end. He had intimated on an earlier occasion that there was a question of principle between the parties and it was very important that a large concern such as that of the defendants should not be under the allegation that they were not carrying out their statutory duty.

His Lordship said he would withdraw the jury and give judgment for the plaintiff for £5,000 with costs. He thought it was a very proper settlement.

Parliamentary News (BY OUR SPECIAL REPORTER)

L.N.E.R. Electrification

IN the House of Commons on February 2nd Mr. Thurtle asked the Minister of Transport if he was now in a position to state an approximate date when the electrification of the London and North Eastern Railway Company's line to Barnet, and its projected linking up with the Tube system, would be completed.

Mr. Burgin said that the company expected that electrified services would be running between High Barnet and the City, *via* the Highgate Tube, by the summer of 1939, and hoped that such services might be running between East Finchley and the West End and City respectively some months earlier. It was also expected that electrified railway services would be put into operation between High Barnet and Finsbury Park early in 1940.

Fencing on the Southern Railway

Brig.-Gen. Clifton Brown asked the Minister of Transport whether he would arrange with the Southern Railway Company that no extension of electrification would take place in rural areas before the undertaking it had given him as to fencing and protection had been implemented.

Mr. Burgin said that the company informed him that its programme of works for 1938 provided for the erection of over 50 miles of the improved types of fencing. This covered all places where trespassing had been reported as being prevalent or likely to occur, both in the areas already electrified and those in process of being electrified.

Safety Device on the G.W.R.

Mr. McGovern asked the Minister of Transport if he would make inquiries regarding the use of a device on the Great Western Railway which prevented a train passing a signal at danger; and if he would urge or compel its installation on other railways.

Mr. Burgin said that he was fully informed about the system of automatic train control which was installed throughout the greater part of the running lines of the Great Western Railway and operated in connection with the distant signal. Trials had been in progress for some time on the London, Midland and Scottish Railway with an alternative system which performed similar functions. This company, and the London and North Eastern and Southern Railway Companies, had felt it necessary to await the outcome of these experiments before adopting either system. While he had no power to compel the use of automatic train control equipment, he was anxious to encourage its wider use with due regard to the reliability of the apparatus.

Electrical Interference with Broadcasting

Sir W. Womersley, the Assistant Postmaster-General, informed Mr. Parker that consultations were proceeding with commercial and other interests which would be affected by the introduction of a Wireless Telegraphy Bill to deal with the question of electrical interference with broadcast reception. The questions involved were, however, of considerable complexity and the relative inquiries must of necessity take some time to complete.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Key Industry Duty

The Board of Trade has received an application under Section 5 (5) of the Finance Act, 1936, for a licence to import free of duty an apparatus for testing vibrator units, such as are used for the conversion of d.c. to a.c., comprising on one panel:—(1) A milliammeter calibrated in cycles for frequency measurement. (2) A voltmeter calibrated in percentages for indicating the proportion of the cyclic period during which the contacts of the vibrator are closed. (3) A group of laboratory type instruments for measuring the electrical characteristics of the vibrator unit as follows.—(a) A milliammeter and a voltmeter for the primary circuit; (b) a milliammeter and a voltmeter for the secondary circuit; (c) two ammeters to measure the current at each primary contact; (d) a milliammeter measuring the vibrator coil current. Any representations that a similar apparatus is made, or is likely to be made within a reasonable time, in the United Kingdom or in the Dominions, should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, London, S.W.1, within one month from February 1st.

Compensation for Displaced Employés

At a recent meeting of the Dover Town Council it was reported that the town clerk, borough electrical engineer and representatives of the trade union side of the National Joint Industrial Council for the Electricity Supply Industry had discussed the payment of compensation to six of seven workmen displaced as a result of the cessation of local generation. The Electricity Committee recommended the payment of compensation in these cases, and in that of the man not represented by the Union, on the basis of four and a half times their weekly wage for each year of service to the nearest multiple of £5 above the amount. The total amount of compensation to be paid was reported to be £2,010.

E.D.A. Sales Management Conference

The seventh E.D.A. annual Sales Management Conference was held at the Connaught Rooms, London, from January 31st to February 2nd. The total number of applications for seats was 220, an advance of almost 50 per cent. upon the corresponding figure of last year, representatives attending from supply authorities in practically every part of the country. During the conference the following papers were read:—"Unification of National and Local Campaigns," by Mr. V. W. Dale; "The Repair and Maintenance of Domestic Appliances," by Mr. R. Dimmack (Newport); "Organisation for Giving General Service to Consumers," by Mr. Wm. A. Royle (Sunderland); "Economics and Principles of Supply Costs and Tariffs," by Mr. D. Bellamy (Hull); "Planned Selling," by Mr. G. E. Barrett (Northmet); "Water Heating," by Mr. G. Parsonage (Croydon); and "Thermostatically Controlled Cookers," by Major G. C. Milnes (Lancaster). A noteworthy feature was that over a hundred separate contributors were represented in the general discussions. The whole question of planned selling was exhaustively discussed and the tremendous possibilities of national campaigns in accelerating electrical development were brought out by the proceedings. An aspect of general domestic development which received special attention was the question of cooker repair and maintenance work. Mr. Bellamy's paper dealing with the analysis of supply costs was generally acknowledged to be an extremely useful contribution to this complex subject.

New "Southmet" Showrooms

The district of Downham lying between Catford and Bromley, Kent, is rapidly becoming an important shopping centre, stimulated by the growth of housing estates developed by the L.C.C. and by private owners on each side of the main Hastings Road. To meet the growing demand for electricity in this district the South Metropolitan Electric Light and Power Co., Ltd., has recently opened a showroom and demonstration theatre at 492-494, Bromley Road. At the same time

The new showrooms of the South Metropolitan Electric Light and Power Co., Ltd., at Downham

premises of a similar nature were made available to the public at 207, High Street, Penge, to serve the southern portion of the company's area. In both instances a departure has been made from the previous practice of completely shutting off the demonstration room from the showroom; plain glass doors and windows are fitted between them, so that although noise from the showroom does not disturb the demonstration the stage and audience are visible to customers calling at showroom.

Australian Electrical News

Our Australian correspondent reports that the Victorian State Ministry has accepted the tender of Gibson, Battle (Melbourne) Pty., Ltd., as agents for a Swiss firm, for the supply of a 30,000-kW turbo-generator for the Newport "B" power station. The price submitted by the successful tenderer was £98,889, as against £108,699 quoted by an Australian firm, and £107,109 by an English company. The extension of the Newport "B" power station is part of the

Delegates at the E.D.A. Sales Management Conference which was held last week in London

extensive Kiewa hydro-electric proposal, which is estimated to cost a total of £9,000,000.

The new power house extension at East Perth will, it is expected, be tried out very shortly, and should be in a position to carry a commercial load within a few weeks of the completion of the trials.

All States experienced a very busy Christmas, generally accepted as one of the best since pre-depression days, and in Western Australia thought to be even better than the peak year of 1929. Electrical traders had little to complain of, the smaller lines moving freely for a period of some three weeks before the festive season. Competition from cheap Japanese lines has lessened, the trouble experienced through this class of merchandise having brought so much adverse publicity that the public is now very wary of buying it.

The subway of the Temple Meads Station, Bristol, lighted by means of Holophane dome refractors

Electrical Contractors' Dinners

Bad workmanship in electrical installations in homes all over the country and the need for the employment of standard electric plugs were two points made by Mr. F. Forrest, chief engineer and general manager of Birmingham Electric Supply Department, at the annual dinner of the Birmingham branch of the Electrical Contractors' Association on February 1st. Mr. Forrest said that none of the plugs in a flat into which he had recently moved was of standard type. He paid tribute to the work done by the E.C.A. and referred to the difficulty experienced by Birmingham Corporation in getting installations carried out by first-class contractors. They could not compel people to be registered contractors, and with their limited powers so long as the installation tested properly they were bound to connect up. He had yet to learn what could be done to stop the abominable work that was being put in all over the country and in Birmingham as well. There was much to be said for the Continental system of wiring on the surface, which was easily inspected. He hoped that perhaps the new Distribution Bill would give the supply authorities power to deal with such shoddy wiring in a more drastic way. Mr. H. E. Walker, the president of the E.C.A., responding to the toast of the Association, said that it wanted a fair and reasonable attitude in both directions between supply authorities and contractors; the adoption of the fair trading policy by supply authorities, manufacturers, wholesalers and contractors; the setting up of a proving house with powers to prevent distribution of unsatisfactory equipment; for employés, registration, continuity of satisfactory employment, with provision for holidays with pay and old age; and for employers, that security and fair treatment which was the right of those who satisfactorily served their purpose in any section of the industry. Mr. L. C. Penwill (director and secretary) also spoke of the necessity of installation work being entrusted only to members of the Association or registered contractors.

The annual dinner of the Bradford Branch of the Electrical Contractors' Association will be held at the Great Northern Victoria Hotel, Bradford, on February 25th, when Sir Eugene Ramsden, M.P., Alderman J. W. Longley, M.I.M.E., A.M.I.E.E., and Mr. T. Roles, city electrical engineer, will be among the guests. Mr. H. Moss will be in the chair.

Mercury Lamps for Clock Dials

An unusual application of electric lamps of the mercury vapour type is to the illumination of the clock dials of the Stockwell War Memorial Tower. The four-dial clock is arranged for translucent internal lighting. A central gas lamp, employing a group of mantles, was formerly fitted closely over the clock mechanism, but was not entirely satisfactory for several reasons. The new electrical installation displays the dials in a clear greenish light with the hands, figures and minutes in sharp contrast. The visibility of the clock has been much improved, for shadows of the dial-wheels and shafting behind the dial-plates have been reduced, and the time can be read distinctly at a considerable distance. This public clock is believed to be the first to be fitted with mercury-vapour lamps, and the success of the experiment by the Lambeth Borough Council indicates possibilities in other directions.

A Railway Station Lighting Scheme

The accompanying illustration shows an interesting lighting installation which has recently been completed in the new Temple Meads Station subway for the Great Western Railway Co. at Bristol. The lighting problem was to illuminate the 30-ft. wide subway efficiently while directing high intensity lighting on to the posters on the walls. The roof of the subway is of corrugated steel section, and advantage was taken of the recesses in the roof for concealing the lighting units, and thus cutting off the glare from the eyes of pedestrians using the subway. Two rows of lighting units are arranged along the subway at a height of 8 ft. 9 in. from the floor. The side of the subway, which is arranged for poster display, is equipped with 100-W Holophane asymmetric prismatic dome refractors. These units give an excellent downward light with a special angular light segment for illuminating the posters. The other half of the subway, which has a number of kiosks and shop windows, is equipped with Holophane symmetrical dome refractors for general lighting. Both rows of refractors are spaced 8 ft. from each wall. The higher section of the subway at one end is equipped with 200-W Holophane "Ripplelite" units on stay tubes fixed at a height of 10 ft. 6 in. The work was carried out by the electrical staff of the Great Western Railway.

A Guide to the Factories Act

The Home Office has issued a "Guide to the Factories Act, 1937" (Stationery Office, 6d. net) in which the principal provisions of the Act are explained for the use of factory owners. Under Part VII of the Act special reference is made to its application to electrical stations. This section was fully dealt with by Mr. J. W. Thomas in the ELECTRICAL REVIEW of August 6th, 1937, page 180.

A New Method of Shop Lighting

Recent experiments in combining "Osira" mercury electric-discharge and tungsten filaments lamps have resulted in a new development in shop lighting. The new system evolved by the General Electric Co., Ltd., has been given the name of "T.O.T.," indicating that two tungsten lamps are employed for every "Osira" used in the lighting of shop windows. A similar combination, with a slightly different arrangement of the lamps, is equally effective for interior illumination. In shop windows "Gecoray" reflectors are employed, the lamps being placed in groups of three. Normally each group consists of one 80-W "Osira" lamp with a tungsten lamp (75-, 100- or 150-W according to the quality of the colour required) on each side. In the largest windows the appropriate intensity can be achieved by 125-W "Osira" and 200-W "Osram" lamps, similarly arranged. It is claimed that the blending of the reddish light from the "Osram" lamps and the greenish-white of the "Osira" lamps gives a very brilliant result with a considerably lower consumption than would be necessary to obtain equal intensity from any other system.

One of the show windows at Magnet House, Kingsway, in which the G.E.C. has installed its new system of shop lighting

By no other method, however, could the peculiar quality of the light be obtained. The light is particularly satisfactory for showing coloured articles and silver or silver-plated goods, and all small articles are given the appearance of standing out in relief. For interior lighting a similar combination can be employed in opal enclosed fittings. These are usually spherical in design, 14 in. or 16 in. in diameter, and the lamps are specially arranged to give uniform colour of light.

A Sales Promotion Scheme

The Consolidated Edison Co., of New York, has introduced a new plan for promoting the sale of electrical appliances which officials of the utility believe will offer an opportunity for the sale of twenty million dollars' worth of such products. Under the programme, residential consumers in Greater New York may obtain a credit on the purchase of appliances through some 900 approved dealers. The credit will be based on the amount of electricity consumed in the month preceding the purchase and is not to exceed twenty-five per cent. of the purchase price.

"Glass Age" Exhibition Train

To give architects, the building trade and the public all over the country some idea of how beautiful and useful glass can be, Pilkington Bros., Ltd., of St. Helens, have equipped a "Glass Age" exhibition train which this week is on view at Victoria Station, London, before a 2,200-mile tour. There are about 200 varieties of glass, and most of them are included in the train. Two of the most important are "Insulight" masonry, a glass brick with a partial vacuum inside that gives it a high insulating value against temperature and sound, and armourplate glass, which has special fire-resisting properties and mechanical strength. Examples of the uses of armourplate glass on view include low- and high-voltage insulators, a searchlight projector, a bulkhead fitting, cathode and anode holders and an accumulator jar. With the aid of glass attractive lighting effects are obtained. One decorative feature is built up of radiating fins of armourplate glass, and an illuminated screen is composed of glass "rolling pins" mounted in front of clear prismatic glass. For the most part "Evenlite" tubular and "Osram" lamps are used, and the fittings include a number of Troughton and Young "Ultralux" designs. Approximately 120,000 miniature mirrors are used in the "Vitroflex" which covers the outside of the train, and at night a vivid spectacle is produced when the train is floodlighted. A 7-kW Lister set in an engine room on the train generates the electricity required.

Part of the interior of the "Glass Age" train
[Elec. Rev. photo.

Selling Electrical Apparatus in Turkey

A country in which a great deal is being done towards the promotion of greater domestic consumption of electricity is Turkey, and in this development the Helios concern is playing an important part. It has shops and representatives throughout the country, and imports electrical appliances and equipment from nearly all parts of the world, its business including all branches of electrical machinery and appliances. Its premises in Istanbul have recently been reconstructed and now are among the most modern of their kind in the country. On the ground floor the more common apparatus is shown, including a great variety of lighting fixtures, refrigerators, both domestic and commercial, electric irons, heating pads, and other small appliances. At one side of the building is a series of smaller rooms each of which is given over to special products. One room, for example, is a radio department, another contains batteries of all sorts, another scientific and laboratory equipment, &c. The upper floors of the five-storey building are used as offices, including a sales department for the whole of the country. When there is the possibility of popularising some particular line in provincial centres intensive propaganda is organised by experts sent from this department, and in general these efforts have proved very successful.

A showroom in the Helios building, Istanbul

Social Events

We have attended the annual staff ball of the North Metropolitan Electric Power Supply Co., for many years past and we look forward to this popular function as one of those occasions when we meet old friends and make new ones. This year's dance was held on Friday last at Seymour Hall, Seymour Place, W., and proved the jolly affair which we have come to expect. Everyone was intent on having a good time, and thanks to Mr. A. P. Thorogood, who had arranged an excellent programme, including a first-rate cabaret, old-time dances and carnival novelties, the evening went with a swing, dancing continuing until the early hours.

The annual dinner given by the directors of Laurence, Scott & Electromotors, Ltd., to the senior office and works staff at Norwich, was held on February 1st, when a company of about 260 spent a very enjoyable evening. In proposing the toast of "The Firm," Capt. G. J. Scott (managing director) stated that the output for 1937 was four and a half times that of 1930, and 50 per cent. more than in 1936. He referred to the extensions both at Norwich and Manchester. The welfare of the workpeople was not forgotten, activities in this direction, including the provision of an efficient modern heating installation and an extensive programme of redecoration in the older parts of the factory. The toast of "The Staff and Men" was proposed by Mr. G. H. Wilson. Replying for the men, Mr. E. Rackham expressed their appreciation of the efforts made by the directors to improve their working conditions, and of the "prosperity bonus" paid at the end of last year.

The annual party of the G.E.C. Service Depôt was held at Napier Hall, Vincent Square, London, S.W., on January 29th, the number of staff and friends present being 170. In addition to dancing and games the entertainment included an amusing stage show entitled "In Westminster To-night." The prizes for the fancy dress, spot and lucky dances were presented by Mrs. M. M. Macqueen.

The B.I.F. and the Plastics Industry

The British Plastics Federation, Ltd., is organising a special trade luncheon for the members of the plastics industry at the forthcoming British Industries Fair. The luncheon will be held in the Conference Room in the gallery of the National Hall, Olympia, on February 24th. Visitors, as well as members, can obtain tickets (10s. 6d. each) from the secretary, British Plastics Federation, Ltd., 1-3, St. Paul's Churchyard, London, E.C.4.

The F.B.I. Business Forecast

The "Business Forecast" published in the F.B.I. "Business Barometer" for the first quarter of 1938 states that deceleration is on the way. Neither the rate at which it will proceed nor its duration can yet be forecast. Rearmament continues to be our mainstay. In other directions a period of readjustment is ahead. The sharp recession which has occurred in the United States, the leading consumer of primary raw materials, is an especially disturbing influence, and until the outlook is clearer it is not possible to judge whether this represents a temporary set-back only, or whether it heralds a more fundamental change in trend. At the moment the latter seems the more probable, but a good deal must depend on the policy pursued by President Roosevelt during coming months.

Orders Recently Booked

The War Department has recently placed an order with J. Gerber & Co., Ltd., for the supply of a 1,000-kW Bruce Peebles convertor, complete with switchgear. The company has contracted to supply and erect the plant within three weeks from the date of the order.

Sunbeam Commercial Vehicles, Ltd., has received a further order from the Wolverhampton Corporation for six four-wheel double-deck trolley-bus chassis of the M.F.2 type, this being the tenth repeat order placed by the authority for Sunbeam-B.T.H. trolley-bus chassis. The bodies will be constructed by Park Royal Coachworks, Ltd.

Bennie Lifts, Ltd., have received a contract for the supply of five high-speed, fully automatic, super silent lifts, especially constructed for hospital work, dual and collective control, together with self-levelling apparatus being incorporated in the mechanism, for Johannesburg General Hospital. The installation will be carried out by the company's resident engineers, the Premier Lift & Escalator Co. (Pty.) Ltd., of Johannesburg. The company has also been entrusted with the lift installations for Barclays Bank, Tel-Aviv, Palestine, and the heavy luggage lifts for the S.I. Railway, Coimbatore Station, India.

A Meech motor control, supplied by Meech Electric Devices, Ltd., has recently been installed in a large new "Cossar" newspaper press in the printing works of the *Bournemouth Times*. The electrical installation work was carried out by the Bournemouth and Poole Electric Supply Co., Ltd.

Employés' Pension Scheme

Vickers, Ltd., announce that pension and life assurance schemes for the members of the staffs have been arranged, which it is hoped will come into operation on March 1st next. Detailed particulars of the schemes are being put before the members of each company's staff in the course of the next few days. The eventual adoption of the schemes is contingent on an agreed percentage of the eligible members electing to join. In future it will be compulsory for all new members of the staffs to enter. The members of the staffs who will be offered participation in the schemes number between 6,000 and 7,000.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price February 9th.	Fortnight's Inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal)... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£22 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Sbellac ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll... ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¾d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ,,	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£172	£3 dec.
Grade II ... ... ,,	£123	£2 dec.
Grade III... ... ... ,,	£73	—
c Brass (rolled metal 2" to 12" basis)... per lb.	8d.	¼d. dec.
c ,, Tubes (solid drawn) ... ... ,,	11¼d. to 11¼d.	—
c ,, Wire, basis ... ... ,,	8¼d.	¼d. dec.
c Copper Tubes (solid drawn) ... ,,	1/0¼	—
g ,, Bars (best selected)... ... per ton	£75	—
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£43 15s.	15s. dec.
d ,, ,, Wire Rods ... ,,	£48 15s.	15s. dec.
d ,, ,, H.C. Wire ... per lb.	7¾d.	¼d. dec.
f Ebonite Rod ¼" dia. & up ... ... ,,	1/10 to 2/5	—
f ,, Sheet ⅛" thick & up ... ,,	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12... ,,	2/4	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	6¾d.	¼d. dec.
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s.	—
i ,, Wire galv. No. 1 P.O. Qual.... ,,	£23	—
g Lead, English Pig ... ... ,,	£17	15s. dec.
g Mercury ... ... per bot.	£12 17s.	—
e Mica (in original cases) small ... per lb.	10d. to 2/–	—
e ,, ,, ,, medium ... ,,	6/– to 12/6	—
e ,, ,, ,, large ... ,,	13/– to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2¼	—
p ,, ,, drawn bars & rods ,,	1/1¼	¼d. dec.
p ,, ,, rolled strip & sheet ,,	10¾d.	¼d. dec.
p ,, ,, wire ... ... ,,	1/0¼	¼d dec.
o Platinum ... ... per oz.	£7	—
d Silicium Bronze Wire ... ... per lb.	8¾d.	¼d. inc.
g Spelter ... ... per ton	£14	10s. dec.
g Tin, Block (English)... ... per ton	£178 15s.	£1 15s. dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/3	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Trade Announcements

Duncan Watson (Electrical Engineers), Ltd., have removed to Kelvin House, Cleveland Street, London, W.1. The showrooms at 62, Berners Street, W., are being maintained for several months.

The head offices of Vactric, Ltd., and Apex-Vactric, Ltd., have been removed to the new factory at Honeypot Lane, Stanmore, Middlesex (Telephone : Wordsworth 4321 (10 lines)). Telegrams : Vactrify, Phone, London). The Vactric works will remain at Cricklewood, N.W.2, and the Apex-Vactric works will be at the new Honeypot Lane building.

Mr. H. J. Bowden, importer, exporter and manufacturers' agent, has removed to 93, Turnmill Street, E.C.1, where he will carry larger stocks of cables and flexibles than in the past.

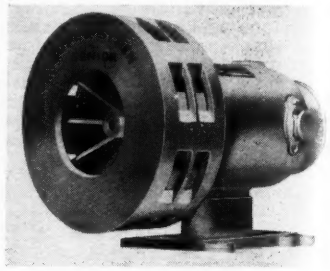
The new factory which the Scott Insulated Wire Co., Ltd., is building at Queensbury, Middlesex, is now almost completed, and the company hopes during the current month to transfer its offices and stores to the new building, and commence installing plant. The new factory will bear the name of Queensland Works.

New York World's Fair

The Department of Overseas Trade announces that Stanley Hall and Easton & Robertson have been appointed architects for United Kingdom Government participation in the New York World's Fair of 1939.

An Electric Syren

In connection with the prevailing interest in air-raid warnings the Service Electric Co., Ltd., 122, Pratt Street, London, N.W.1, informs us that it has introduced an improved electric syren. The characteristics of this device are the distinctive note and easy installation and once fixed it requires no attention. The universal motor is encased in watertight aluminium castings and the bearings require no oiling. The castings which form the motor housing are anodised to render them impervious to corrosion. For some purposes it is necessary to have syrens on which short blasts can be made for signalling purposes as syrens in the ordinary way give a long wail when being switched off. With a view to obtaining short blasts a dynamic braking apparatus has been designed for use with the syren. These syrens, although normally wound for 100 or 200/250 V, can also be arranged for 6 or 12 V for use on police cars and other vehicles.



The "Senior" air-raid warning syren produced by the Service Electric Co.

The "Blue Book"

The 1938 edition of the "Electrical Trades' Directory and Handbook" (the "Blue Book") is now available from the publishers, Benn Bros., Ltd. (25s. net). As in previous years the directory is arranged in four main sections. The first is a collection of data of a commercial and technical kind. This is followed by an alphabetical section, giving the names and addresses, the telephone numbers and telegraph addresses of individuals and companies in the electrical industry. The third section is similar to the preceding one but is arranged geographically, and the fourth is a classified list, covering all trades directly or indirectly connected with the industry. References to the various sections is facilitated by thumb index tabbed cards.

House Wiring at Neath

An allegation that Neath householders were deceived by "foreign" firms who forced people to sign contracts for wiring houses, with the result that no electricity was installed for more than two months, was made at a recent meeting of Neath Borough Council by Councillor J. Shea. He said people had complained to him of paying 12s. 6d. for the wiring of their houses for electricity and being without light for long periods. He remarked that there should be some kind of safeguard for these people. Councillor D. G. Davies said that there were agents of "foreign" firms travelling all over the town forcing people to sign forms, and at the same time deceiving them that they could have immediate supplies of electricity. When several other members had expressed similar views, it was decided to refer the matter to the Parliamentary Committee.

Public Health Exhibition

The Hospitals, Nursing, Midwifery and Public Health Exhibition will be held at the New Agricultural Hall, Westminster, S.W., from February 28th to March 4th. A well-equipped stand arranged by E.D.A. will occupy a prominent position in the show.

Lamp Production in Russia

The production of electric lamps in Russia, stated to have amounted to 90 millions in 1937, is this year to be increased to 110 millions.

New Catalogues and Lists

Marconi-Ekco Instruments, Ltd., Electra House, Victoria Embankment, London, W.C.2.—Leaflets illustrating and describing a standard signal generator and a modulated radio-frequency oscillator.

British Thermostat Co., Ltd., Windmill Road, Sunbury-on-Thames.—Practical and technical details are given in new leaflets dealing with thermostats and pressure controls for refrigeration plant.

J.P. Tubular Heater, Co., Ltd., Newarthill, Motherwell.—A folder on tubular heaters and a 36-page booklet dealing with low-temperature heating generally.

Jackson Electric Stove Co., Ltd., 143, Sloane Street, London, S.W.1.—A blotter for February.

Phœnix Telephone & Electric Works, Ltd., 38, Newman Street, London, W.1.—A 111-page catalogue of bells, buzzers, batteries, indicators, switches, telephones and allied equipment.

Buncher & Haseler, Ltd., Branston Street, Birmingham, 18.—A leaflet illustrating various kinds of metal reflectors.

Bull Motors, Ltd., Cecil Chambers, 86, Strand, London, W.C.2.—New catalogue sheets dealing with super silent continuously rated a.c. motors, control gear, junior service lift motors, and two-speed Squirrel cage lift motors.

Bankruptcy Proceedings

G. C. Spong and **J. H. Trussell,** trading under the name of the C.C.S. Trading Co., 30, Western Mail Chambers, Cardiff, electricians. (Separate application of G. C. Spong.)—This debtor applied for his discharge recently at the Law Courts, Cardiff. The receiving order, it was stated, was made in 1925, when debtor's deficiency amounted to £388. It appeared that some time prior to the receiving order he had put £500 into a business connected with electrical manufacturing and the supplying of cinema equipment. He had drawn nothing from the business, and attributed his failure to the loss of a large contract. The discharge was granted.

J. T. Southwood, 13, Brandreath Road, Compton, Plymouth, lately carrying on business at Belgrave Garage, Mutley, Plymouth, electrical engineer.—Competition and losses through an employé were alleged to be the causes of this debtor's appearance at his first meeting of creditors held recently at 11, St. Aubyn Street, Devonport, Plymouth. His deficiency amounted to £2,638. The case being a summary one was left in the hands of the Official Receiver as trustee.

H. P. Ansell, electrical consultant (trading in partnership with others as H. P. Ansell and Partners and as Engineering Services), First Avenue House, High Holborn, and lately at City Chambers, Broad Street, Birmingham.—The statutory first meeting of creditors in this case was held on February 7th at London Bankruptcy Buildings. The proceedings were purely formal, but it transpired that the debtor returns his liabilities at £650 against assets valued at £350. The case was left in the hands of the Official Receiver.

J. W. Colleer, Radio Stores, 3, Heybridge Street, Heybridge, Maldon, Essex, radio dealer.—The first meeting of creditors herein was held on February 3rd at 29, Russell Square, London, W.C.1. According to the statement of affairs returned there were ranking liabilities of £532 and net assets of £127, leaving a deficiency of £405. Debtor attributed his failure to insufficient capital, poor trade owing to the greater attraction of Maldon as a shopping centre, and the expenses of a motor van proving too heavy for the profits made in his business. The case being a summary one was left in the hands of the Official Receiver as trustee.

J. R. L. Allen, lately of 51, Chigwell Road, South Woodford, and 68, Clapham Road, London, S.W., radio dealer.—The first meeting of creditors was held on February 3rd at London Bankruptcy Buildings before Mr. C. T. Newman, Assistant Official Receiver. The receiving order was made on January 21st on the petition of A. Warner & Son, Ltd., creditors for £65. The chairman reported that the proofs of debts, amounting to £310, had been received but that debtor had not surrendered to the proceedings, and nothing was known regarding his present movements. The Woodford premises had been closed and cleared of all stock. The case was left in the hands of the Official Receiver.

G. Thorne, radio dealer, The Bungalow, Kittle Green, Bishopston, Swansea, lately trading at 40, Singleton Street and 162, Port Tennant Road, Swansea.—First meeting February 15th at 10, St. Mary's Square, Swansea. Public examination March 11th at the Law Courts, Guildhall, Swansea.

L. C. Rowse, radio and electrical engineer, 20, Western Place, Penryn, Cornwall, formerly trading at 60, Lower Market Street, Penryn.—Last day for receiving proofs for dividend February 19th. Trustee, Mr. C. Hancock, 12, Princes Street, Truro, Official Receiver.

E. Nelson (Elizabeth Nelson & Sons), electrician, 63, Wharton Street, South Shields.—Receiving order made February 2nd on debtor's own petition.

Company Liquidation

Milnes Radio Co., Ltd., Victoria Works, Church Street, Bingley, battery manufacturers.—The creditors were called together at Bradford on January 31st, when Mr. H. S. Milnes, the managing director, occupied the chair. W. Driver & Simpson, 63, Great George Street, Leeds, submitted a statement of affairs which showed ranking liabilities of £19,783, of which £18,393 was due to unsecured creditors, and there were partly secured creditors for £7,926, who hold security valued at £6,536. The net assets were £8,680, leaving a deficiency of £11,103. Some time ago the company commenced the manufacture of radio receiving sets. Apparently the costings were incorrect and a loss was sustained. In the autumn of last year the directors came to the conclusion that further capital was required and it was believed that it would be obtained from a financial house in London. Negotiations took place and £1,000 was forthcoming, but finally the financial house declined to go further in the matter. Voluntary liquidation was then decided upon. The liabilities included the bank for £1,273, and they held a third party guarantee. Certain of the creditors' claims had also been guaranteed. The partly secured creditors held hire-purchase agreements to a total of £9,014, but they were only valued at £6,535. For the purposes of the statement the stock had been liberally depreciated as the major portion consisted of parts. The deficiency was attributed to losses on the trading, depreciation of the assets in the statement of affairs and the writing off of the goodwill which stood in the books at £2,504. Last year a fire broke out which involved a serious loss, and the company had had to face severe competition. The creditors decided to confirm the voluntary liquidation of the company with Mr. Driver as liquidator, and a committee was also appointed.

New Zealand Electrical Trade

Recovery continued

THE promise of continued recovery in the electrical trade of New Zealand has been fulfilled. In 1936, as compared with 1935, imports showed increases in practically all lines, those in the radio group, insulated wire and cable and unspecified electrical apparatus being outstanding. The United Kingdom kept her lead in the trade generally but was still second to the United States in the radio business. Canada and Australia are gaining a footing in the New Zealand market, although their shares are still small.

Figures showing the share of the principal countries participating in the trade in 1936 have been extracted from the official returns and are given below, together with notes of increases or decreases compared with 1935.

Continued expansion is shown by the preliminary statistics (totals only) which are available for seven months of 1937. For that period the aggregate value of electrical machinery and equipment imported was £1,428,000 as compared with £929,000 during the corresponding months of 1936 and of radio apparatus £430,800 against £259,000. Under both these headings the United States improved its position.

	1936. £(000).	Inc. or dec. on 1935. £(000).
Storage batteries and parts—		
Total	97	− 1
From United Kingdom	23	− 1
„ Canada	12	− 4
„ Australia	57	+ 5
Other batteries and cells—		
Total	70	+ 21
From United Kingdom	23	+ 5
„ Canada	27	+ 7
„ Australia	4	—
Carbons or electrodes for arc lamps or for electric welding—		
Total	26	− 2
From United Kingdom	17	+ 6
„ Australia	5	− 8
Insulated cable and wire—		
Total	307	+ 103
From United Kingdom	286	+ 97
„ Holland	6	+ 3
„ United States	7	+ 1
Insulators—		
Total	30	+ 2
From United Kingdom	15	—
„ Canada	12	+ 7
Filament lamps—		
Total	184	+ 27
From United Kingdom	169	+ 26
„ Holland	4	+ 2
„ United States	11	− 1

	1936. £(000).	Inc. or dec. on 1935. £(000).
Other electric lamps—		
Total	46	+ 16
From United Kingdom	16	+ 5
„ Germany	4	+ 1
„ Japan	8	+ 2
Electric ranges—		
Total	62	+ 9
From United Kingdom	46	+ 6
„ Canada	16	+ 4
Radio receiving sets mounted in cabinets—		
Total	102	+ 21
From United Kingdom	27	+ 16
„ Canada	6	− 2
„ United States	33	− 12
„ Australia	35	+ 25
Radio receiving sets built up but not mounted in cabinets—		
Total	87	+ 26
From Canada	7	+ 3
„ United States	76	+ 20
Radio valves—		
Total	94	+ 25
From United Kingdom	10	− 8
„ Holland	8	− 4
„ United States	72	+ 33
Other radio apparatus—		
Total	158	+ 49
From United Kingdom	35	+ 17
„ United States	66	+ 16
„ Australia	54	+ 18

	1936. £(000).	Inc. or dec. on 1935. £(000).
Other telegraph and telephone apparatus—		
Total	104	+ 29
From United Kingdom	90	+ 23
„ United States	9	+ 5
„ Australia	2	+ 1
Other electrical apparatus (duty free if British)—		
Total	630	+ 266
From United Kingdom	470	+ 219
„ Canada	21	+ 14
„ Germany	9	—
„ Sweden	16	+ 4
„ United States	64	+ 9
„ Australia	39	+ 17
Other electrical apparatus (dutiable)—		
Total	125	+ 40
From United Kingdom	83	+ 31
„ Germany	2	+ 1
„ Canada	4	—
„ United States	14	+ 5
„ Japan	3	—
„ Australia	19	+ 3
Motors—		
Total	175	+ 50
From United Kingdom	85	+ 24
„ Germany	3	+ 2
„ United States	55	+ 12
„ Canada	15	+ 6
„ Sweden	12	+ 5

Electricity Supply

Lighting, Domestic, Power

Austria.—SUPPLY PROGRESS.—A Government return summarised in *E.u.M.* shows that at the end of 1936 there were 186 supply undertakings in Austria, as compared with 180 at the end of 1935. The output during the twelve months amounted to 2,555 million kWh, an increase of 3 per cent. on the preceding year.

Bath.—ELECTRICITY v. GAS DEBATE.—There was a lengthy discussion at last week's meeting of the City Council when the Housing Committee recommended that the tender of the Electricity Department should be accepted for the installation, supply and fixing of water-heaters, wash-boilers, cookers and other necessary equipment, &c., in the 508 houses to be erected on the Roundhill and Whiteway municipal housing estates. The Department's tender was stated to represent a saving on that of the gas company of £700 in first cost and £127 per annum in maintenance. Every member of the Council, it was reported, had received a copy of a communication which the engineer and manager of the gas company had addressed to the town clerk, requesting that the matter might be reconsidered on the grounds that the tenders were not on the same specification. It was pointed out that the "Ascot" was an instantaneous and the "Sadia" a storage heater. Alderman Day said that if the gas company had had to supply in addition a place for storing water the cost would have been more. The recommendation of the Committee was approved by seventeen votes to fourteen, shareholders in the gas company not taking part.

Beeston.—SODIUM LIGHTING.—A system of lighting by twenty-four 150-W sodium lamps installed by the Derbyshire and Nottinghamshire Electric Power Co. was inaugurated last week.

Belgium.—NO STATE CONTROL.—According to the President of the Union des Exploitations Electriques en Belgique there is no likelihood, as has been rumoured, of the supply of electric power in Belgium being placed under the Government's control.

Birkenhead.—METER TESTING.—The Electricity Committee is applying for permission to borrow £1,775 for meter-testing equipment.

Birmingham.—CONSTRUCTION OF HAMS HALL "B" STATION.—A resolution authorising the Electric Supply Committee to place contracts and proceed with the scheme for the construction of the first portion of the Hams Hall "B" power station, at a total estimated cost of £1,582,398, has been approved by the City Council. The Committee is also to proceed with the installation of an additional boiler unit and the necessary incidental works at Hams Hall "A" power station at an estimated cost of £108,290. The Committee, said Ald. Sir Percival Bower, had been placed in an extraordinary position, having installed turbo-generating plant which it had not been able to operate at full efficiency owing to delay in receiving permission from the Central Electricity Board to install the necessary additional boiler unit.

EXTENSIONS.—Another resolution authorises the Committee to incur expenditure of £150,000 on extensions to the general mains system and £100,000 on sub-stations and equipment. During the past twelve months the Department has connected up an additional 35,000 consumers.

Blackburn.—METER TESTING.—A three-phase, 1,000-A, meter test bench is to be purchased by the Electricity Committee at an estimated cost of £1,200, to be met out of revenue.

STREET LIGHTING.—A sum of £2,500 is to be spent by the Corporation on lighting a new road at Little Harwood, the carrying out of improvements to existing lighting, and the lighting of areas in course of development.

Blaydon-on-Tyne.—SUPPLY TO NEW HOUSES.—Owing to a dispute between the Urban District Council and the North-Eastern Electric Supply Co., Ltd., regarding the erection of overhead lines, tenants of new houses in the Stella area are having to use oil lamps. The company proposes to supply the houses by means of overhead lines, and although the tenants are agreeeable to this, the Council has refused to give its consent.

Bolton.—SUB-STATION.—The Electricity Committee is to erect a sub-station in the Folds Road district.

Bridgend.—REQUEST FOR SUPPLY.—A deputation last week urged that the Council should extend its mains to Heollaethog, the cost of which was given as £900. It was stated that about thirty householders would take a supply, apart from a number of farms, and that the developments by the South Wales Coalite Co. in erecting an oil-from-coal plant would lead to an increased demand. The chairman of the Lighting Committee said that the average income from farmhouses received by the Bridgend electricity undertaking in the whole of the area was only £3 per annum. It was decided to notify the Council that as the revenue would be insufficient it was regretted that the extension could not be carried out.

Brixham (Devon).—PETITION AGAINST PARLIAMENTARY BILL.—A petition by the Urban District Council has been lodged against the Brixham Gas and Electricity Bill, one of the purposes of which is to authorise the Brixham Gas & Electricity Co. to raise additional capital. The Bill is due for consideration in the present Parliamentary session.

Carlton (Notts).—MERCURY LIGHTING.—An estimate of the cost of lighting Woodborough Road with mercury electric-discharge lamps is being prepared by the Council's surveyor.

Chanctonbury.—OBJECTION WITHDRAWN.—The Rural District Council has withdrawn its objection to low-voltage overhead lines being employed in supplying electricity to Thakeham, subject to the posts not being visible from Thakeham Church.

China.—JAPANESE COMPANY TO CONTROL SHANGHAI UTILITIES?—Japanese officials in Tokyo and Shanghai are reported to be investigating economic conditions in the Shanghai area with a view to establishing a special Japanese corporation for the control of the public utilities in the Shanghai area, including electricity supply.—*Reuter* (Tokyo).

Eccles.—SUPPLY EXTENSION.—The Corporation is to provide a supply of electricity to the Barton Hall Park and Edison Road estates, at a cost of £958.

"ALL-IN" SHOP TARIFF.—The following "all-in" tariff for shops has been adopted:— Lock-up shops: A fixed annual charge of 30 per cent. of the net rateable value of the premises, plus ½d. per kWh. Combined shop and house premises: A fixed annual charge of 25 per cent. of the net rateable value of the premises, plus ½d. per kWh for all electricity consumed for lighting and other purposes.

METER TESTING.—The Electricity Committee is to purchase meter-testing equipment at an estimated cost of £1,390.

Eston.—LOANS.—Sanction is being sought by the Electricity Committee to loans of £2,000 for mains, £1,000 for consumers' apparatus, £2,000 for meters, and £500 for consumers' installations.

Finland.—ENERGY SALES IN HELSINGFORS.—The consumption of electricity in the Finnish capital during 1937 totalled 108 million kWh, an increase of 15 per cent. over the preceding year.

Hornsey.—CHANGE-OVER.—Approval has been given by the Town Council to a further change-over from d.c. to a.c., to cost £113,446. Four sub-stations are to be built, two in Harringay, one in Hornsey and one in Highgate.

Hull.—PREPAYMENT METERS.—The Electricity Committee has obtained sanction to borrow £15,000 for prepayment meters.

India.—NEW PLANT IN THE PUNJAB.—Our Bombay Correspondent states that the full development of the Uhl River hydro-electric project in the Punjab will soon be reached. The final stage of development, which is now being undertaken by the Government, requires the construction of a second power station lower down the river to which water from the tail race of the existing power-house will be led by means of an open duct about three miles long with a fall of 1,200 ft The new power-house will have a capacity of 48,000 kW, giving a total of 118,600 kW for the two stations. The cost of the Uhl River scheme as estimated at present is Rs. 60,000,000, including contributions made to the Kangra Valley Railway. A notable feature is that the headworks and the generating stations are situated in two different regions, separated by a 15,000-ft. tunnel, which is the longest in India.

TRAVANCORE HYDRO-ELECTRIC PROGRESS.—A further report from Bombay confirms that the first stage of the Pallivassal hydro-electric scheme which is under construction in Travancore State will be completed in the course of this year, and that the supply will be available in 1939. The ultimate capacity of the project as at present designed is 22,500 kW, but the present programme of construction is for the development of 9,000 kW from the falls in the Mudrapuzsha River, the total head available being 1,900 ft., which is distributed over a distance of three miles of the river course. The generated energy will be stepped up to 66 kV by three 500-kVA outdoor-type transformers.

CALCUTTA SALES.—During 1937 the Calcutta Electric Supply Corporation, Ltd., sold 348.2 million kWh, an increase of 12 per cent. over 1936.

Japan.—STATE CONTROL OF ELECTRICITY.—A *Reuter* report from Tokyo states that a technical discussion is proceeding in committee of a highly controversial Bill, now before the House of Representatives, which provides for State control of the Japanese electric power industry. The opposition to the Bill has apparently been somewhat disarmed by an announcement by Mr. Nagai, the Minister of Communications, that the estimated dividend rate of the semi-official concern which will undertake the State control will be 6 per cent. in the initial year, 6½ per cent. in the second year, and 7 per cent. for several years afterwards. Electricity rates, he added, will be reduced by 10 per cent. in the initial year and by 30 per cent. ten years later.

NEW HYDRO-ELECTRIC POWER STATION.—According to the *Far Eastern Review*, a 77,000-kW hydro-electric power station is being put into operation in the Kurobe gorge by the Nippon Electric Power Co. The Daido Electric Power Co. has placed a contract for the construction of a large reservoir on the upper reaches of the Kiso River in connection with new power stations to be established at Kasagi and Nezamenotoko.

Kettering.—OVERHEAD LINES.—The erection of overhead lines to Duck End, Cranford, is to be proceeded with by the Electricity Department.

Lanarkshire.—ALL-NIGHT LIGHTING.—A recommendation has been adopted by the County Council for all-night all-the-

year-round lighting in the main streets of Bothwell and Uddington. The lighting will be by either mercury or sodium electric discharge lamps. The estimated capital expenditure is £8,300.

Latvia.—NEW WATER-POWER PLANT.—A large new water-power station is in course of construction at Kehums, on the River Daugavas. Originally two generating sets were planned, but the scheme has now been altered to give an output of 70,000 kW from four sets.

Leeds.—ELECTRIC HEATING FOR BATHS.—The Baths Committee has accepted a revised offer of the Electricity Department for providing and maintaining the plant and supplying the energy for heating the Roundhay open-air bathing pool over a period of fifteen weeks during the summer months. The inclusive charge is £240.

EMERGENCY ELECTRICAL PLANT FOR GAS DEPARTMENT.—An emergency electrical generating plant is to be installed at Meadow Lane and New Wortley Works by the Gas Committee at a cost of £3,446, to provide against a failure of the normal electricity supply in the event of air-raid damage.

London.—SOUTHWARK.—At a meeting of the Council last week Councillor C. J. Mills reported that a deputation representing Southwark Labour Party and Trades Council had complained of the operations of the Fixed Price Light Co., which, it was alleged, made the cost of lighting very high. Councillor Mills said that the Electricity Committee sympathised with the views of the deputation. It was, however, in a difficulty, because there were very few consumers of the company in the Council's area of supply. The Committee, however, felt that there was widespread dissatisfaction in parts of the borough outside the municipal service. It was decided to send a protest to the Electricity Commissioners.

Middlesex.—AIR PURIFICATION.—In view of the congestion in the offices of the Local Taxation Department at certain times of the year the County Council has decided to install electrical air cleaning equipment.

SUB-STATIONS.—The Electricity Committee is seeking sanction to borrow £10,000 for sub-station buildings.

Northern Ireland.—RATE CONTRIBUTION.—The Belfast Electricity Committee has agreed to contribute £16,500 to the relief of the rates in the next financial year.

Nottingham.—LOAN FOR DEVELOPMENT.—The capital sum of £250,000 sanctioned last May for mains, services, transformers, switchgear, meters, &c., having been nearly spent, the Electricity Committee is now applying for permission to borrow a further similar amount. This is required for mains and services; transformers, switchgear and mains in connection with the high voltage supply; the erection of sub-stations; meters; electrical apparatus for hire, and assisted wiring.

Oxford.—BILL TO ACQUIRE COMPANY'S UNDERTAKING.—At a meeting of the City Council on Monday it was decided to promote a Parliamentary Bill authorising the Council to acquire the undertaking of the Oxford Electric Co., Ltd. It was stated that the Minister of Transport would raise no objection to the Bill. The Electricity Committee was also authorised to take any legal or other steps necessary to prevent the Oxford Co.'s undertaking being transferred to the Wessex Electricity Co. Dr. H. T. Gillett, chairman of the Electricity Committee, said that last year the City Council opposed the Wessex Electricity Bill before a committee of the House of Lords. Why, then, did the Electricity Commissioners not inform the Council of the proposed transaction? No communication had been received from them as far as he was aware until January 11th, and this was in reply to the Council's letter of January 3rd asking whether they would receive a deputation. They stated that following the passing of the Wessex Electricity Act, 1937, they gave their approval to the transfer to the Wessex Co., subject to the deed of transfer being executed in the form submitted by the company with certain drafting amendments. On these grounds they had twice refused to give the Council an interview. If under the existing state of law the powers of the Commissioners were insufficient to prevent a large area of the city being handed over to the Wessex Co. without the Council even being informed of the intended transfer and against its unanimous vote a year ago, it was clear that a new Bill was needed which would enable them to safeguard the interests of consumers in obtaining electricity as cheaply as possible. Apparently Lord Meston thought that the Commissioners had power now to refuse to sanction a transaction when the interests of the consumers were adversely affected. During the discussion it was asserted that areas adjacent to those supplied by the Oxford Electric Co. as well as that company's own area were anxious to be supplied by the Council. It was decided to communicate with other municipalities owning electricity undertakings with a view to the promotion of a concerted defence of municipal undertakings throughout the country in the event of there being proposals unfavourable to them in Government legislation.

Palestine.—SAFED.—The medieval town of Safed, in North Palestine, famous as the stronghold of the Cabalists, is soon to have an electricity supply, an agreement between the Town Council and the Palestine Electric Corporation, Ltd., having been approved by the Government. Work on the scheme is to start in March, and the installation should be ready by the summer.

Rugby.—SYSTEM IMPROVEMENTS. The rapid growth of the undertaking has made it necessary to carry out an extensive scheme of reorganisation. First, the Electricity Committee is to deal with the high-voltage side, the improvements to which are estimated to cost £31,851.

Silsden.—ELECTRICITY BARRED?—At last week's meeting of the Urban District Council, Mr. A. MacDonald moved that Council tenants should be given permission to have electricity installed at their own expense. Mr. F. Watson moved that a special sub-committee should be set up to go fully into the question and report to the Council. Neither found a seconder.

Southgate.—EXPERT ADVICE.—An expert is to be appointed to advise the Council on the preliminary consultation in connection with the statement of capital expenditure on the Southgate undertaking submitted by the North Metropolitan Electric Power Supply Co. Councillor A. C. Crane, chairman of the Electricity Committee, said that the Committee had done a great amount of work, and it had had a frank interchange of views with a director of the company.

South Shields.—MAINS AND SWITCHGEAR.—Application is to be made by the Town Council for sanction to borrow £37,000 for mains and switchgear in connection with the second year's instalment of the scheme for reorganising the electricity undertaking.

Stockport.—STREET LIGHTING.—Decision has been deferred on the application of the General Purposes Committee for sanction to borrow £18,854 for lighting the main roads in the town. Representatives of the General Purposes, Gas and Electricity Committees are to be invited to confer with a sub-committee regarding the charges for public lighting.

Sunderland.—ILLUMINATIONS.—The Town Council is being recommended to spend about £9,000 on the annual illuminations display at Roker which this year will begin on September 10th and last until October 9th.

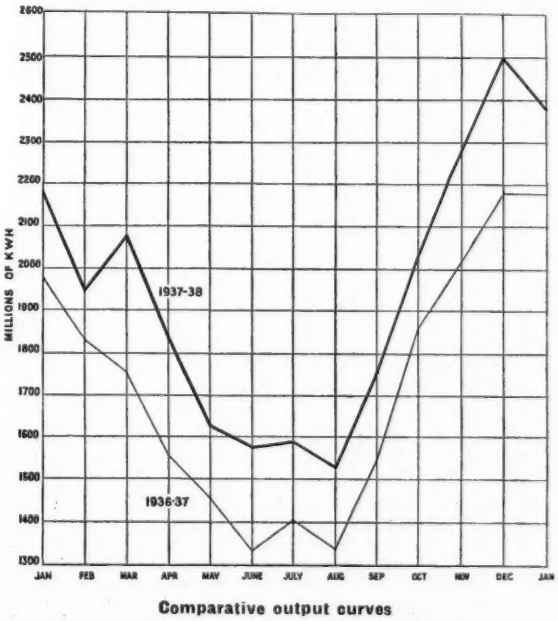
Sweden.—UTILISATION OF WATER-POWER.—According to a report published recently by the Swedish Board of Trade an aggregate of 124,000 kW was added during 1937 to the existing system of water-power stations, and by the end of the year work had been commenced on a further expansion by 113,000 kW. From an aggregate turbine output of 1,071,000 kW in 1930 the utilisation of water-power has grown to 1,467,000 kW.

POWER STATIONS AND AIR RAIDS.—The Swedish Waterfalls Board has outlined a national scheme for the protection of vital parts of the electrical network in the event of possible air raids. Sweden has about 1,400 water-power plants, of which some thirty deliver 65 per cent. of the entire production, so that protective measures may safely be confined to the big stations. The scheme for defence of these is estimated to cost approximately £1,250,000.

Totnes.—INSTALLATIONS IN COUNCIL HOUSES.—Consideration has been given to the question of installing electricity in Council houses throughout the district, and the Torquay Electricity Department is being approached for its terms.

Generation of Electricity in January

OFFICIAL returns rendered to the Electricity Commissioners show that 2,382 million kWh of electricity was generated by authorised undertakings in Great Britain during



Comparative output curves

January as compared with the revised figure of 2,176 million kWh in the corresponding month of 1937, representing an increase of 206 million kWh, or 9.5 per cent. The number of working days in the month (*i.e.*, excluding Sundays) was twenty-six, the same as last year.

Worthing.—DISTRIBUTION.—Improvements are to be made in the distribution system in the Offington district at a cost of £610.

York.—LOANS.—Sanction is being sought by the Electricity Committee to borrow £40,000 for mains and services and £32,473 for the augmentation of the feeder system and sub-stations.

FRINGE ORDER.—The Committee has obtained a Fringe Order to supply certain premises at Howsham.

Traction

Argentina.—TRANSPORT SERVICES IN BUENOS AIRES.—A *Reuter* message from Buenos Aires states that a decree was issued last week approving the plan for the co-ordination of the transport services in Buenos Aires. It provides that fares shall be just and reasonable, and shall cover operation costs, depreciation and reserves and assure the capital of the transport consortium of a minimum of 7 per cent. for the sinking fund and interest. This clearly provides that shareholders shall not receive more than 7 per cent. for dividend and for the sinking fund to cover the fifty-six years' concession, but there will be no provision for the latter for the first six years in view of the undesirability of overburdening transport in its infancy. The capital of the consortium has been established and the allocation to each constituent is as follows (all amounts given in pesos): Anglo-Argentine Tramways (210,167,301), Buenos Aires Municipality (109,527,242), Hispano-Argentine Subways, including "Undergrounds" buildable (105,759,755), B.A. Central Railroad and Terminal Co. (62,875,750), Omnibus Companies (58,681,417), Government of the Republic (38,719,594), B.A. Lacroze Tramways (36,026,998), B.A. Town and Docks Tramways (10,064,242) and Southern Electric Tramways (7,740,556).

Belgium.—TROLLEY-BUS EXTENSIONS.—A proposed trolley-bus route in Brussels from Ixelles to Forest will serve three large suburbs, the Quartier Leopold, and the business centre around the Place de Namur. In Liège, six tramway routes are being converted to trolley-bus operation, and extensions to three of them have been sanctioned.

STATE RAILWAY ELECTRIFICATION.—The Metropolitan Committee appointed by the Belgian Government to consider the question of further railway electrification held a meeting in Brussels recently, when it was reported that the electrification of the Brussels-Antwerp line had proved a profitable undertaking. As it was estimated that a return of from 3 to 4 per cent. could be expected from the Brussels-Charleroi line, if electrified, it had been decided to recommend that the work should be put in hand. The Committee did not approve a recommendation of a sub-committee that all the lines for a distance of about 20 miles from Brussels should be electrified, its view being that the electrification of the heavier trafficked lines between Brussels and such towns as Namur, Ghent and Mons would be preferable.

Bolton.—MOTOR-BUSES PREFERRED TO TROLLEY-BUSES.—A decision was reached by the Town Council at its meeting last week that as existing tram tracks became worn-out they should be abandoned and oil-engine buses substituted as the future mode of transport. Councillor Longworth, chairman of the Electricity Committee, moved that the matter should be referred back, with an instruction to the Transport Committee to get expert opinion on the relative merits of the trolley-bus and oil-engine bus. On the recently converted Dunscar route he believed the buses carried 20 per cent. more passengers than trams, but 60 per cent. more mileage had been run. The extra income from buses was £567, but with trolley-buses the extra income would have been £1,200. To convert overhead tram equipment for trolley-buses the transport manager estimated a cost of £3,600 per mile, but Councillor Longworth's information was that it could be done at £1,900 per mile, if not less. The trolley-bus was track-bound, but so was the oil-engine bus, which could only travel in an authorised direction. If the Transport Department guaranteed to take 7 million kWh a year for ten years he would ask the Electricity Committee to make a substantial reduction in the charge for energy. Councillor Bentley said that figures from seven undertakings proved that the all-in cost of trolley-buses was about 3d. per mile more than that of oil-engine buses. The amendment was heavily defeated.

France.—PARIS SUBURBAN LINE.—An electric service on the line from the Luxemburg terminus to Massy-Palaiseau and Sceaux-Robinson has just been inaugurated. The line belonged to the P.O.-Midi Railway and was electrified by it on the standard 1,500-V d.c. system, but the whole line has now been handed over to the Paris Métro.

Gateshead.—OBJECTIONS TO TRANSPORT BILL.—The Town Council has decided to petition against the Bill which is being promoted by the Gateshead and District Tramways Co. for power to abandon the present tram system and introduce a trolley-bus service. The Council is itself promoting a Bill to take over the tram company's system and replace it with trolley-buses. The Northern General Transport Co., Ltd., and the Sunderland and District Omnibus Co. have lodged objections against the Gateshead Corporation's Bill.

Holland.—ELECTRIC TRAINS.—It is intended to introduce electric trains on the inner network of the Dutch railways in March or April. These will displace the Diesel coaches.

London.—CENTRAL LINE IMPROVEMENTS.—Reconstruction work now in progress on the Central Line tube railway has as its object the discarding of the rolling stock built specially for it and the use of standard stock of larger capacity and higher maximum speed. Nearly 10,200 segments of the cast-iron tunnel lining have been taken down and replaced more accurately to increase the effectual diameter of the tunnel. A fourth rail is to be laid and new signalling installed. The platforms are being made about 35 yds. longer to accommodate eight-car trains. The Central Line is built on the switch-back principle to assist the braking and acceleration of trains, the line rising 1 ft. in 60 ft. approaching a station and falling away at the rate of 1 ft. in 30 ft. on leaving a station, and as the platforms could not be extended on these gradients the track is being raised in the new station tunnels.

BUS LIGHTING.—The London Passenger Transport Board has decided that when the present lamps in buses in the London area need replacing the pearl type shall be employed. Experiments have indicated that these give a 7½ per cent. better light than the opal lamps at present in use. The opal type will continue to be provided in Green Line coaches, however, as they are considered better for the eyes on long journeys.

Manchester.—MOTOR-BUS SERVICE DECISION.—When the report of the Transport Committee came before the City Council last week Alderman R. W. Shepherd moved an amendment that the proposed conversion of the Moston to Chorlton-cum-Hardy tram route to motor-bus operation should be deferred. He said that on various occasions the Electricity Committee had made appreciable concessions to the Transport Committee on the definite understanding that there would be no further conversions of tram services until the result of the Ashton Old Road experiment was available. The present proposal, he said, would result in a loss of revenue to the Electricity Department of £12,684 a year. Councillor N. Beith, opposing the amendment, said that the service was being run at a loss and every previous conversion to motor-buses had proved successful. Motor-buses cost 2d. a mile less to run than trolley-buses. Alderman Sir William Davy, chairman of the Transport Committee, said that as soon as the results of the trolley-bus experiment were available the Committee would put itself unreservedly in the hands of the Council. It was neither for nor against trolley-buses. In the meantime, he urged the Council to let the Department carry on like any other concern. The amendment was defeated.

Sweden.—RAILWAY ELECTRIFICATION.—*Reuter's Trade Service* learns from Stockholm that the private railway company Hälsingborg-Hässleholms Järnvägs-Aktiebolag, according to a provincial paper, has written to the Government asking permission to electrify the Hälsingborg-Aastorp-Hässleholm line, a distance of 77 km. The cost is estimated at 2,400,000 kr.

Switzerland.—ANOTHER ELECTRIC RACK RAILWAY.—The four-mile rack railway from Glion to Rochers de Naye, above the Lake of Geneva, is being electrified on the d.c. system. Glion is connected with Montreux by a rack railway already electrically operated.

Communications

Great Britain.—RADIO RELAYS.—As forecast in this column last November, subscribers to the Post Office radio relay system at Southampton will have the choice of about four programmes. Foreign programmes will be relayed, but not sponsored programmes. Distribution will be at audio frequencies by underground cables, and any work carried out in connection with existing telephone wiring will be of an experimental nature only. Local retailers, if they decide to co-operate, will be invited to supply suitable loud-speakers to subscribers.

Italy.—MARCONI STAMPS.—Stamps bearing the portrait of the late Marchese Guglielmo Marconi have just been issued by the Italian Post Office as a tribute to his memory, states *The Times*. They are in denominations of 20 c., 50 c., and 1 l. 25 c., and bear the inventor's portrait within a laureated oval frame inscribed with his name, surmounting a replica of the arms of Savoy flanked by Fascist emblems.

Northern Ireland.—NEW B.B.C. HEADQUARTERS.—The B.B.C. announces that the erection of new Northern Ireland headquarters at Belfast will begin shortly. A prominent site near the business centre of the city has been chosen for the six-storey building. The accommodation will include a large studio (60 ft. by 44½ ft.) on the ground floor; two talks studios, music library and listening hall on the first floor; and two dramatic studios, effects studio and listening rooms on the third floor. Technical equipment (the control room, machine room, battery room, cubicles, echo rooms) will be housed on the fourth floor. Because the studios, owing to the special purposes for which they are intended, cannot have natural ventilation, they will be artificially air-conditioned by a system involving special precautions to eliminate noise. This feature, of course, is common to broadcasting studios.

Russia.—5,300-MILE TELEPHONE AND TELEGRAPH CABLE.—According to the *Bulletin d'Informations* the Government has recently placed a contract with Standard Telephones & Cables, Ltd., for the establishment of a combined telephone and telegraph cable from Moscow, across Siberia, to Khabarovsk, near the frontier of Manchukuo, a distance of about 5,300 miles.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Argentina.—BUENOS AIRES.—February 14th. Sanitation Works Department. Electric deep well pumps. (T. 23748/37.)*

Australia.—MELBOURNE.—February 22nd. Deputy Director, Posts and Telegraphs. L.c. cable. (T. 16641/38.)*

BRISBANE.—March 30th. City Electric Light Co., Ltd. One electric goods lift. (T.Y. 17341/38.)*

Aylesbury.—March 1st. Electricity Department. Materials for twelve months. (See this issue.)

Barry.—February 19th. U.D.C. Electric bells, lamps and conduits for twelve months. E. R. Hinchsliff, surveyor, Council Offices.

Beckenham.—February 21st. Electricity Undertaking. Stores for one year. (January 28th.)

Blackburn.—February 28th. Electricity Committee. Cable, wire and meters for twelve months. (February 4th.)

Bristol.—March 4th. Port Authority. Two 1½-ton electric travelling portal cranes for Fry's Wharf, Canon's Marsh. Secretary, 19, Queen Square (deposit £3).

Buckhaven and Methil (FIFE).—February 23rd. Town Council. Electrical installations in 262 houses. Town Clerk, Municipal Buildings (deposit £1 1s.).

Bury.—February 12th. Rewiring Jericho Institution. S. Wilkinson, county architect, Preston (deposit £2).

Cardiff.—February 14th. City Electricity Department. Switchgear for twelve months. (January 28th.)

Cheadle and Gatley.—February 14th. Electricity Department. Materials for twelve months. (January 28th.)

Derby.—February 14th. Electricity Supply Department. Domestic apparatus control equipment. (February 4th.)

March 1st. County Council. Cables, lamps and electrical accessories for twelve months. (See this issue.)

Dumfries.—March 1st. Town Council. Electrical installation in six houses at Church Street. Town Clerk.

March 5th. Dumfries and Galloway Royal Infirmary. Electrical installation at auxiliary hospital. J. A. Will, secretary and treasurer, 3, Great King Street.

Egypt.—CAIRO.—March 2nd. Ministry of Public Works (Mechanical and Electrical Department). Two aircraft warning light installations. (T.Y. 17043/38.)*

Erith.—February 28th. Electricity Department. Meter testing equipment. (February 4th.)

March 7th. Electric water-heaters. (See this issue.)

Felixstowe.—February 21st. Electricity Department. Two 250-kVA transformers (6,000/415/240 V). (February 4th.)

Finchley.—February 28th. Electricity Department. Stores for twelve months. One five-ton cable drum-carrying trailer. (See this issue.)

Gloucester.—February 14th. Electricity Department. Meter testing instruments. (February 4th.)

Great Yarmouth.—February 24th. Borough Council. Materials for twelve months. (January 28th.)

Hazel Grove and Bramhall (CHESHIRE).—March 3rd. Electricity Department. One 500-kVA transformer. (See this issue.)

Heston and Isleworth.—February 23rd. Electricity Department. One 3-phase transformer and e.h.v. switchgear. (See this issue.)

Honley.—February 21st. Electricity Department. One 1,500-kVA transformer, e.h.v. cable, and conversion of two 400-kVA transformers to automatic voltage regulation. (See this issue.)

Hove.—February 18th. Electricity Department. Materials for twelve months. (February 4th.)

Huddersfield.—February 16th. Corporation. Electrical work at trolley-bus depôt, Longroyd Bridge. Town Clerk, Town Hall.

February 23rd. Installation of electric plugs in 1,417 Corporation houses. Town Clerk, Town Hall.

India.—NEW DELHI.—March 4th. Indian Stores Department. Table standards, wires, shades, lampholders, lamp locks, &c., for one year. (T. 16825/38.)*

April 26th. Wall plugs and sockets, ceiling roses, &c. (T.Y. 16826/38.)*

Inverness.—Lewis Hospital, Stornoway. Electric lighting installation, &c., at nurses' home. G. Gordon & Co., architects, 6, Queensgate.

Kettering.—February 25th. Electricity Department. Cables and meters for one year. (February 4th.)

Leeds.—February 16th. Electricity Department. Stores for one year. (January 28th.)

Littleborough.—February 19th. Electricity Department. One 500-kVA, three-phase transformer, one two-cubicle, 11,000-V switchboard, one l.v. switch cubicle, one l.v. metering and neutral panel and one distribution pillar. (February 4th.)

February 26th. Cables and meters for twelve months. (See this issue.)

London.—HACKNEY.—February 23rd. Electricity Department. Cables and flexible cords. (January 28th.)

HAMMERSMITH.—February 23rd. Electricity Department. Switchgear and transformers. (February 4th.)

ISLINGTON.—March 2nd. Borough Council. Exhaust pipes. (See this issue.)

POPLAR.—March 9th. Borough Council. Stores for twelve months. (See this issue.)

STOKE NEWINGTON.—February 16th. Electricity Department. Stores for one year. (February 4th.)

STEPNEY.—February 28th. Cables for twelve months. (See this issue.)

Long Eaton.—February 19th. Electricity Department. Meters, cutouts and cables for twelve months. (February 4th.)

Lossiemouth.—February 26th. Town Council. Electrical installations in twenty-two houses at Coulardhill. Town clerk.

Manchester.—March 16th. Corporation Airport Committee. Installation of aerodrome lighting, including equipment, switchgear and cables. (See this issue.)

Middlesex.—February 28th. County Council. Electrical sundries for twelve months and X-ray, &c., requisites for six months. (See this issue.)

Milford Haven.—February 24th. Electricity Department. Two 100-kVA transformers, one 25-kVA pole mounting transformer, l.v. cable and l.v. switchgear. (See this issue.)

New Zealand.—WELLINGTON.—March 10th. Posts and Telegraph Department. One motor generator set. (T. 17071/38.)*

April 6th. One electric cross-cut saw. (T.Y. 17265/38.)*

Northern Ireland.—BELFAST.—February 25th. One 6.6-kV skeleton bus-bar section panel and trunking, fire extinguishing equipments, a.c. motors, and wiring to replace existing d.c. installation. (See this issue.)

Perth.—February 21st. Corporation. Two sets of glass-bulb mercury rectifiers, complete with switchgear, transformers and automatic control gear. (February 4th.)

Salford.—February 16th. Electricity Department. Stores. (January 28th.)

February 23rd. Cookers, fires, water heaters, wash boilers, kettles, switches and fuse boxes. (February 4th.)

February 22nd. One oil circuit-breaker. (See this issue.)

South Africa.—PRETORIA.—March 3rd. Union Tender and Supplies Board. One Diesel engine, two alternators, three switchgear panels, three transformers, one a.c. motor, cable and cable end boxes. (T.Y. 17428/38.)*

JOHANNESBURG.—March 19th. City Council. L.v. cable end boxes. (T. 17427/38.)*

Southampton.—February 15th. Electricity Department. Transformers, switchgear and cables. (January 28th.)

February 18th. Transformer kiosks, switchgear, cables, stores and materials, domestic apparatus and meters. (February 4th.)

Spenborough.—February 17th. Electricity Department. Meter testing equipment. (February 4th.)

Stoke-on-Trent.—March 9th. Electrical Engineer's Department. Mains and cables and e.h.v. sub-station switchgear for one year. (See this issue.)

Sutherland.—March 5th. County Council. Electric lighting at a new school at Golspie. County clerk, Golspie.

Walton and Weybridge.—February 14th. Electricity Department. Materials for two years. (January 28th.)

Warrington.—March 8th. Visiting Committee. Heating and electrical installation and kitchen equipment for County Mental Hospital, Winwick. (February 4th.)

West Mersea.—February 14th. U.D.C. Electric motor and automatic switch control for water tower. E. Stockdale, engineer, Council Offices.

Wolverhampton.—February 18th. Borough Council. Materials and equipment for twelve months. (January 28th.)

February 23rd. Switchgear for twelve months. (See this issue.)

Worcester.—February 26th. Electricity Department. Cables, conductors, transformers and meters for twelve months. (February 4th.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Cardiff.—Electricity Committee. Accepted. Switchgear for Sandon Street sub-station (£5,880).—G.E.C. Cables (£1,774).—Pirelli-General.

Coxhoe.—Parish Council. Accepted. Erection of overhead electric network in connection with the extension of the electricity supply.—B. L. Oliver.

East Ham.—Electricity Committee. Recommended. Four traction feeder panels (£812).—Bertram Thomas. Switchgear.—Crompton Parkinson (£1,429); Switchgear & Cowans (£1,359). Water heaters.—English Electric Co.

Leeds.—Housing Committee. Accepted. Electrical installations at houses in course of construction. Halton Moor housing estate: Gallagher & Co. (£440), Allenby and Stockell (£135), G. E. North & Co. (£2,580), Hall & Stinson (£2,518). Parklands, Seacroft, housing estate (£6,094).—Hall & Stinson.

London.—L.C.C.—Electric wiring, &c., at Poole's Park School:

	£		£
Pemberton and Sturgess. Accepted	**1,081**	Read and Partners	1,262
F. H. Wheeler and Co.	1,127	Collins Electrical	1,286
H. J. Cash and Co.	1,210	J. E. Swann and Co.	1,309
Berkeley Electrical Engineering Co.	1,216	Henfrey (Electrical)	1,396

Wiring, &c., at Furzedown Training College, Streatham:

	£		£
Berkeley Electrical Engineering Co. Accepted	**2,077**	W. H. Gaze and Sons	2,489
City Electrical Co.	2,192	Atozed (London)	2,557
Holiday and Son (Electrical) ...	2,316	G. E. Taylor and Co.	2,620
Electrical Installations	2,317	T. Clarke and Co.	2,689
Samuel Reed and Sons	2,386	Archibald Meckhonik	3,002
Francis Polden and Co.	2,403	Malcolm and Allan (London) ...	3,094

Manchester.—Electricity Committee. Accepted. Street lighting columns.—Bromford Tube Co. Electric water heaters for twelve months.—Heatrae; Aidas Electric; Archibald Low; Hotpoint. Coal conveyor for Barton power station.—W. J. Jenkins & Co. (sub-contractor for motors and switchgear, Met.-Vick. Elecl. Co.). Drag scrapers, &c., for Barton and Stuart Street power stations.—International Combustion (sub-contractors for motors and switchgear, Met.-Vick. Elecl. Co.).

Accepted. Mercury-arc rectifier equipment.—Hewittic Electric Co.

Nottinghamshire. — County Health Committee. Recommended. Electrical services at Balderton mental colony (£14,705).—Cox-Walkers, Ltd.

Plymouth.—Electricity Committee. Accepted for twelve months: E.h.v. switchgear.—A. Reyrolle & Co. Transformers and l.v. armourclad switchgear.—G.E.C.

Wakefield.—Housing Committee. Accepted. Wiring eighty-four houses in Dewsbury Road.—H. Smith.

Wallasey.—Electricity Committee. Accepted. Fire protection system at Seaview Road sub-station (£1,401).—Mather & Platt.

Forthcoming Events

British Industries Fair.—Monday, February 21st, to Friday, March 4th. London and Birmingham.

Institution of Electrical Engineers.—Monday, February 14th. Institution, London, W.C.2. 7 p.m. Informal meeting. Discussion on "Electric Radiators of the Heat-Storage Type," to be opened by Mr. W. L. Shand.

Transmission Section.—Wednesday, February 16th. Institution, London, W.C.2. 6 p.m. "High Speed Protection." Messrs. T. W. Ross and C. Ryder.

North-Eastern Centre.—Monday, February 14th. King's College, Newcastle-on-Tyne. 6.15 p.m. Papers on "Domestic Electric Cookers," by Messrs. O. W. Humphreys and J. N. Waite.

Western Centre.—Monday, February 14th. Merchant Venturers' Technical College, Bristol. "Electrified Railways in Europe and in North America." Mr. F. T. Barwell.

Mersey and North Wales (Liverpool) Centre.—Monday, February 14th. Central Hall, Renshaw Street. 7.30 p.m. Faraday Lecture on "The Evolution of Electrical Power." Dr. A. P. M. Fleming.

Wednesday, February 16th. The Temple, Dale Street. 6.30 p.m. "The Design of Circuit Breakers." Mr. C. J. O. Garrard. (Joint meeting with the Liverpool Engineering Society.)

North Midland Centre.—Tuesday, February 15th. Hotel Metropole, Leeds. 7 p.m. Cooker papers by Messrs. O. W. Humphreys and J. N. Waite.

Northern Ireland Sub-Centre.—Tuesday, February 15th. Belfast. 6.30 p.m. "Multi-Channel Telephony." Col. A. S. Angwin and Mr. R. A. Mack.

North-Western Centre.—Tuesday, February 15th. Engineers' Club, Manchester. 7.15 p.m. Discussion on "The Engineer and the Economic Outlook," to be opened by Dr. W. Jackson and Mr. G. R. Polgreen.

Wednesday, February 16th. College of Technology, Manchester. 7.30 p.m. Faraday Lecture. Dr. A. P. M. Fleming.

Sheffield Sub-Centre.—Wednesday, February 16th. Royal Victoria Hotel, Sheffield. 7.30 p.m. Address by the President, Sir George Lee.

Irish Centre.—Thursday, February 17th. Trinity College, Dublin. 6 p.m. "Rural Electrification." Mr. J. S. Pickles.

Electrical Engineers' Ball.—Friday, February 11th. Grosvenor House, Park Lane, W.1.

Association of Mining Electrical Engineers.—(*South Wales Branch*).—Saturday, February 12th. Queen's Hotel, Cardiff. 7 p.m. Annual dinner.

Electrical Power Engineers' Association.—(*Devon and Cornwall Section*).—Saturday, February 12th. Queen's Hotel, Torquay. Annual dinner and dance.

Salford Technical and Engineering Association.—Saturday, February 12th. Royal Technical College. 7 p.m. Lecture on "Electric Welding," by Mr. S. W. Carpenter.

Association of Supervising Electrical Engineers.—Tuesday, February 15th. 2, Savoy Hill, London, W.C.2. 7.15 p.m. "For and Against Compulsory Wiring Regulations and Registration. Mr. H. A. Crabtree.

Institution of Chemical Engineers.—Friday, February 18th. Hotel Victoria, W.C.2. 11 a.m. Annual meeting. 2.15 p.m. "Some Applications of Electrical Precipitation to Industrial Effluent Gases." Dr. H. J. Bush. 7 for 7.30 p.m. Annual dinner.

Notes

I.E.E. London Students

An interesting programme has been arranged for the second half of the 1937-38 session of the London Students' Section of the Institution of Electrical Engineers. Among the papers to be read are the following:—February 21st: "Wireless Waves in the Upper Atmosphere," by Mr. J. F. M. Mellor. April 12th: "The Electrical Engineer and Production Costs," by Mr. E. J. Mathieson. April 25th: "Radio at Very High Frequencies—the Dependence of its Advance upon the Development of the Valve," by Mr. B. Drake. The annual dinner will be held on March 3rd, an address will be given by the president, Sir George Lee on March 16th, and the annual meeting will be held on May 16th. A number of visits have also been arranged which will include the following:—February 25th: Research Laboratories of Callender's Cable & Construction Co., Ltd., at Shepherds Bush. March 11th: The central control station of the C.E.B., Park Street, S.E. March 23rd: The trunk and international telephone exchanges, Faraday Buildings, Carter Lane, E.C. April 9th: The meter laboratories of the "Northmet" Co. at Friern Barnet Road, N.11. April 23rd: The British Sangamo Co., Enfield. May 7th: The Dubilier Condenser Co., North Acton. Problems night is on March 29th.

I.E.E. Leicester Dinner

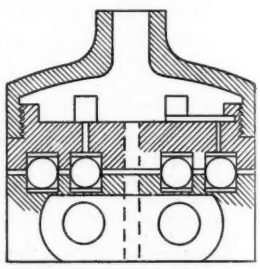
"What developments may come in the future, what inventions may be brought forward will be due in large measure to the members of the Institution," declared Councillor J. Minto (chairman of the Leicester Electricity Committee) speaking at the dinner of the East Midland Sub-Centre of the Institution of Electrical Engineers at Leicester on February 3rd. Councillor Minto was replying to the toast of "The Guests," proposed by Mr. D. H. Parry, chairman of the East Midland Sub-Centre, who presided at the function. Professor Bulleid (chairman of the Midlands Branch of the Institution of Mechanical Engineers) submitted the toast of "The Institution of Electrical Engineers," and Dr. A. P. M. Fleming, vice-president of the I.E.E., responded. Both Mr. H. Hooper (chairman of the I.E.E. South Midland Centre) who gave the toast of "The City of Leicester," and the Lord Mayor (Councillor F. Acton), who replied, paid tributes to Mr. J. Mould, the city electrical engineer and manager. Mr. S. T. Allen (C.E.B.) led the expressions of thanks to the chairman.

London Electrical Engineers

The annual reunion dinner of the No. 5 Company, London Electrical Engineers, will be held on March 19th. Particulars can be obtained from Mr. G. Pressey, 34, Osterley Avenue, Osterley, Middlesex.

A Revolving Connector

A model of a new kind of adaptor and plug has been brought to our notice by Mr. W. Sander, 19, Berkeley Road, Tunbridge Wells, the distinctive feature of which is that the tops of both fittings rotate on ball bearings when a flexible cable is turned out of a straight run. The two ball-bearing races, which are insulated from one another, form parts of the electrical circuit and are said to provide entirely satisfactory contacts. The inventor claims that this arrangement obviates danger of breakage or other damage to conductors due to a twisting strain on connectors used with domestic electrical appliances or telephones. Production models are to be in bakelite.



The swivelling plug-connector

Reorganisation Proposals

The P.E.P. (Political and Economic Planning) Group has followed up its report on the supply of electricity in Great Britain with a survey of the present situation, the Government's proposals and the supply industry's "reaction" to them, and prospective changes. The hope of voluntary amalgamations among the smaller undertakings is considered very small. The need for the Electrical Development Authority proposed in the earlier report is again stressed and it is considered that if the establishment of such a body is impossible the functions might be divided between the Central Electricity Board (economic research) and the British Electrical and Allied Industries Research Association (central testing and design and efficiency of consumers' appliances), the actual structure of the industry being in the hands of the Electricity Commissioners. It is also suggested that all electrical legislation should be brought into one consolidated measure with the amendments required by modern practice, and that the Electricity Commissioners should be given additional powers to secure uniformity of methods of charge, assisted wiring, hire and hire-purchase schemes, and the equipment of showrooms.

Old Faradians' Dance

The annual dance of the Faraday House Old Students' Association, which was held last Tuesday at the Wharncliffe Rooms, Hotel Great Central, London, can always be depended upon to provide exceptionally pleasant dancing, for it is a select affair and never too crowded, and the Rev. L. Van Vestrant, hon. secretary to the Association, can be relied upon to procure a good band. This year's dance was no exception, and an additional surprise was a short cabaret show.

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

HORAX desk lamp reflector shade.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. T. E. Allibone, D.Sc., Ph.D., A.M.I.E.E., has been granted the triennial award of the Coopers Hill War Memorial Prize and Medal by the Council of the Institution of Electrical Engineers for his paper on "The Mechanism of the Long Spark."

Mr. L. W. Brazel, mains assistant in the Darwen Corporation Electricity Department since 1935, has been appointed assistant distribution engineer with the Mersey Power Co. at Runcorn.

Mr. W. Tattersall, of Leicester, has been appointed chief assistant electrical engineer to the Darwen Corporation electricity undertaking.

Prof. Dr. H. Geiger has been awarded the fifteenth Duddell Medal by the Council of the Physical Society.

Mr. J. Ismay, chairman and managing director of Ismay Industries, Ltd., has been appointed chairman of the Tungsten Manufacturing Co.

Mr. R. J. Turner, export manager of C. C. Wakefield & Co., Ltd., has been re-elected chairman of the Institute of Export for the third year in succession.

Mr. W. H. Lund, for several years in charge of the lamp department of Desmo, Ltd., Birmingham, has now joined the British Thomson-Houston Co., Ltd. Mr. Lund is well known as a specialist in the design and construction of anti-dazzle headlight lamps, and in this connection he has made a particular study of the shapes of filaments used in motor car headlight bulbs and their influence on beam formation.

Sir Noel Ashbridge, controller (engineering), and **Mr. L. W. Hayes,** head of the Overseas and Engineering Information Department, of the B.B.C., left London on February 3rd for the quinquennial meeting of the International Telecommunications Conference at Cairo, which they will attend as members of the International Broadcasting Union's delegation.

Mr. A. W. Young

Mr. A. W. Young, M.I.W.Tech., A.M.I.R.E., has been appointed representative in Somerset, Wiltshire and Gloucestershire to the Union Lamp & Lighting Co., Ltd. Mr. Young commenced an electrical trading business in January, 1919, and carried out many large domestic and industrial electrical contracts in the West of England. He manufactured and designed radio apparatus from the advent of broadcasting in this country, and was a keen pioneer experimenter. He subsequently joined Burndept, Ltd., as Western Area manager, and established a Bristol branch for a London factor of electrical and radio goods. In 1936 he joined the Philco Radio & Television Corporation on a special technical sales propaganda scheme.

Mr. R. T. Masson has been appointed burgh electrician at Denny, Stirlingshire.

Mr. A. W. Berry, late of the Brush Electrical Engineering Co., Ltd., has been appointed representative in the North for Ismay Cables, Ltd. Mr. Berry's headquarters will be at the Manchester Office, County Buildings, 4, Cannon Street (telephone: Blackfriars 0488).

Mr. W. G. Crocker, A.C.G.I., D.I.C., A.M.I.E.E., has been appointed works manager and engineer of the Metropolitan Electric Cable & Construction Co., Ltd.

Mr. G. Nelson Haden, B.Sc., A.M.I.Mech.E., was to be inducted as president of the Institution of Heating and Ventilating Engineers at the annual meeting on Wednesday last, following which he was to deliver his presidential address. Mr. Haden is managing director of G. N. Haden & Sons, Ltd.

Mr. H. F. Franklin, for many years with E. W. Bliss, Ltd., has been appointed manager of the power press and sheet metal-working machinery department of George Cohen, Sons & Co., Ltd. The company has also appointed Mr. A. Edwards, formerly of F. J. Edwards, Ltd., as outside representative.

Mr. P. Hamilton, managing director of Everett, Edgcumbe & Co., Ltd., sailed last week with his wife and daughter in the mail liner *Costa Rica* for a visit to the West Indies, Panama and Havana. He will return to this country at the end of March.

Obituary

Mr. H. W. Taylor.—We regret to record the death, which occurred on February 1st, of Mr. Henry William Taylor, M.I.E.E., chief of the Turbo-generator Engineering Department of the B.T.H. Works at Rugby. Mr. Taylor, who was born in London in 1884, joined the staff of the British Thomson-Houston Co. as a junior engineer in 1906, having been during the previous four years technical assistant to the late Prof. Silvanus Thompson at Finsbury Technical College. With the growth of the company's turbine business a special department was formed to deal with engineering problems connected with turbine-driven generators, and Mr. Taylor was chief assistant in that department under Mr. F. H. Clough, whom he succeeded as head of the department in 1920. He was a man of considerable mathematical ability and scientific attainments and had read several papers before scientific bodies, notably one on "Eddy Currents in Stator Windings," for which he obtained his membership of the I.E.E. in 1919. His paper on "The Mechanical Design of Rotating Electrical Machinery," written for the Congrès International d'Electricité was read in Paris in June, 1932. In 1935-36 he was president of the Rugby Engineering Society. In the development of turbo-alternators he was one of the pioneers of high-voltage generation. He introduced into the construction of alternator rotors the use of alloy steels of a much higher grade than had previously been used. Other developments in which he was concerned were the use of non-magnetic steel for retaining rings, and service exciters for turbo-alternators in order to obtain quick response excitation. Mr. Taylor leaves a widow and daughter.

The late Mr. H. W. Taylor

Mr. Thomas Dawson, of Darwen, who died on February 5th, at the age of sixty-two, had been connected with electrical engineering at Darwen over forty years. At one time he was associated with Tootal's Crown Street Works. He was founder-partner in the Union Engineering Co., and subsequently he became chief electrical engineer for J. Place & Sons, Hoddlesden and Eccleshill.

Mr. W. M. D. Pell.—We regret to record the death of Mr. W. M. D. Pell, a director of Oliver Pell Control, Ltd., which occurred on February 8th. Mr. Pell had been associated with the company for the past forty years.

Mr. S. A. Faber, a well-known Danish electrical engineer, died recently at the age of seventy. During the War he was in charge of the construction of some of the largest electric power plant in Germany, Italy and Austria.

The E.A.W.'s Share in Electrical Development

Proposing the toast of the Electrical Association for Women at a luncheon held by the Birmingham and District Branch on Tuesday, the Lord Mayor of Birmingham (Councillor E. R. Canning) said that in encouraging the use of electricity for relieving the ordinary woman from household drudgery the Association was also stimulating the sale of electricity in the city. The number of consumers was increasing by nearly 3,000 a month. Considerable developments had been made in introducing electricity into working-class homes, and great headway had been made in regard to the installation of electric water-heaters, 10,000 having been connected in the city last year.

If parallel developments could be made in rural areas it would be a great revolution for the good of the country. Possibly public utility companies would lose a little money, but the country cottage, the farmer, and agriculture generally, stood very much in need of electricity. Responding, Miss C. Haslett, director of the Association, said she would like to think that some of the progress made in Birmingham was due to the co-operation of the Branch, particularly in connection with demonstration houses, in which the city had given a lead to the country. Mr. J. M. Kennedy, deputy chairman of the Electricity Commission, admitted that women had realised more readily than men the potential influence for good which electricity possessed.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Hale Electrical Co., Ltd.—Private company. Registered January 31st. Capital, £2,000. Objects: To carry on the business of manufacturers of and dealers in radio and electrical apparatus and goods, &c. The subscribers are: A. Barker and Mrs. J. Barker, both of Thorpe View, Barling Road, Southchurch, Essex. A. Barker is the first director. Registered office: Stamford Works, Broad Lane, Tottenham, N.15.

Calray, Ltd.—Private company. Registered February 1st. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in heating apparatus, appliances and machinery of all kinds, engineers, founders, electricians, &c. The directors are: A. H. R. A. Migliavacca, 1, Kilmiston Avenue, Shepperton, Mdx.; and Mrs. M. B. Sfingi, 90, Farringdon Road, E.C. Registered office: 93, Regent Street, W.1.

Japson, Ltd.—Private company. Registered February 1st. Capital, £500. Objects: To carry on the business of manufacturers, general and electrical engineers, consultants, maintenance and service contractors, dealers in radio and television sets, electrical and mechanical clocks, signs, &c. The directors are: R. E. Parsons, Bransby, Thames Ditton; C. J. Jackson, The Observatory, Brightling, Sussex; and D. W. Sayer, 7, Bramley Way, West Wickham. Registered office: 62, Glengall Road, S.E.15.

Gooding Electrical Co., Ltd.—Private company. Registered February 2nd. Capital, £500. Objects: To carry on the business of electrical contractors and engineers, manufacturers of and dealers in electrical fittings and equipment, &c. The directors are: A. H. Gooding and Mrs. E. S. Gooding, both of 37, Dewsbury Road, N.W.10.

A. J. Coleman & Co., Ltd.—Private company. Registered February 2nd. Capital, £7,000. Objects: To acquire the business of a wholesale electrical and radio factor carried on by Arthur J. Coleman as A. J. Coleman & Co. at The Arcade, Northampton. The directors are: A. J. Coleman (permanent) and Mrs. E. A. Coleman, both of 9, The Vale, Northampton. Solicitors: Dennis Faulkner & Alsop, Northampton.

C. H. Gosling, Ltd.—Private company. Registered February 2nd. Capital, £2,000. Objects: To acquire the business of an electrician carried on by C. H. Gosling at 217, Bradford Road, Farnworth, Lancs. The permanent directors are: C. H. Gosling (managing director), 217, Bradford Road, Farnworth; W. Heaps, 159, New Brook Road, Over Hulton, Bolton; and J. Worthington and R. Worthington, both of Karridale, Green Lane, Bolton.

L. H. Veitch, Ltd.—Private company. Registered February 2nd. Capital, £500. Objects: To carry on the business of dealers in and importers and exporters of new and second-hand vacuum cleaners, electrical fittings, fires, cookers, manufacturers of and dealers in radio sets and gramophones, &c. The permanent directors are: L. H. Veitch and A. K. Veitch, both of 83, Kirkstall Road, S.W.2. Registered office: 5, Mitcham Lane, S.W.16.

Radio Controls, Ltd.—Private company. Registered February 3rd. Capital, £100. Objects: To carry on the business of wholesale and retail manufacturers, exporters and importers of and dealers in radio, television, electrical, scientific and telephone apparatus and amplifying instruments, &c. The subscribers are: E. J. Nelson, 20, Essex Street, Strand, W.C.2; and G. H. Beeson, 45a, Tranmere Road, Wandsworth, S.W.18. Secretary (pro tem.): E. J. Nelson. Solicitor: Harry E. Smith, 221, Temple Chambers, Temple Avenue, E.C.4.

Heatley & Hurley, Ltd.—Private company. Registered January 31st. Capital, £1,000. Objects: To acquire from R. P. Heatley and F. E. Hurley, trading as "Radioparts," the goodwill and business of radio, electrical, short-wave and public address engineers carried on at 26, The Triangle, Bournemouth. The directors are: R. P. Heatley, The Shiel, Church Road, Broadstone, Dorset; F. E. Hurley, Lindisfarne, 32, Sedgley Road, Bournemouth; and Comdr. A. F. G. Tracy, R.N. (retd.), Hill House, Spencer Road, Canford Cliffs, Dorset. Secretary: Cecil R. Bourke. Registered office: 6. Poole Hill, Bournemouth, Hants

Gilmore Trading Co, Ltd.—Private company. Registered February 3rd. Capital, £1,000. Objects: To carry on the business of general merchants, wholesalers, retailers, manufacturers, factors, agents, brokers, warehousemen and shippers of radio, electrical, engineering, office and home utilities, &c. The subscribers are: V. Dudley, 382, High Street, S.E.13; and T. H. Bateman, 189, Watling Avenue, Edgware, Mdx. Registered office: 5, Old Manor Court, Abbey Road, N.W.8.

A. & D. Turner, Ltd.—Private company. Registered in Edinburgh January 31st. Capital, £1,000. Objects: To acquire the business carried on by Andrew Robertson under the style of "A. & D. Turner" at 1,253, Shettleston Road, Glasgow, and to carry on the business of general, constructional, electrical, radio, mechanical, civil, mining and consulting engineers, &c. The directors are: W. Hume, 42, Clouston Street, Glasgow, N.W., and five others. Registered office: 308, Clyde Street, Glasgow, C.1.

Anglo-Uruguayan Exploration Syndicate, Ltd.—Private company. Registered February 3rd. Nominal capital £10.000. Objects: To form with the State Electric Light and Telephone Board of Uruguay a consortium for the exploration and exploitation of mineral deposits in Uruguay: to acquire licences, permits or other rights, &c. The subscribers are: F. Willis, 57, Creighton Avenue, N.10, clerk; and E. B. Godfrey, 117, Addington Road, West Wickham, Kent. Solicitors: Bischoff, Coxe & Co., 4, Gt. Winchester Street, E.C.

Electralave, Ltd.—Private company. Registered February 3rd. Capital, £5,250. Objects: To carry on business as carpet, vacuum and steam cleaners and fumigators, and to acquire from the Electric Carpet Washing Co., Ltd., all rights in the trade mark No. 542618, Class 47, "Electralave." The life directors are: Sir Edwin Savill, Home Field, Howe Green, Hertford; H. Marryat, 1, The Terrace, Richmond, Surrey; F. W. P. Taylor, 48, South Eaton Place, S.W. (director of Electric Carpet Washing Co., Ltd.), and three others. Registered office: 45, London Wall, E.C.2.

Value Vacs, Ltd.—Private company. Registered February 5th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in electric cleaners, floor polishers, refrigerators and domestic appliances, electrical and mechanical engineers, carpet cleaners, &c. The directors are: D. G. Horne, High Trees, Chesham Bois, and C. G. Brunning, 109, Elgin Crescent, W.11. Registered office: Evelyn House (Room 76), 62, Oxford Street, W.1.

T. R. Christopher, Ltd.—Private company. Registered February 4th. Capital, £500. Objects: To carry on the business of engineers, manufacturers' agents, founders, smiths, electricians and patentees, &c. The subscribers are: T. R. Christopher, 1, Farrer Road, Hornsey, N.8; and J. H. Aston, 8, Fitzwarren Gardens, Highgate, N.19. Solicitors: Wynne-Baxter & Keeble, 2, Suffolk Lane, E.C.4.

Returns of Electrical Companies

Ferranti, Ltd.—Capital stock, £900,000 in £500,000 7 per cent. cumulative preference stock in units of £1 and £400,000 ordinary stock (10s. units) and shares of 10s. Return dated November 3rd, 1937. £500,000 preference stock and £300,000 ordinary stock taken up. £353,834 paid on preference stock. £446,166 considered as paid on preference and ordinary stock. Mortgages and charges, nil.

Automatic Supplies, Ltd.—L. F. A. Rogers, of 23, Bristol Road, Edgbaston, Birmingham, ceased to act as receiver and/or manager on December 29th, 1937.

Cowley & Wilson, Ltd.—Satisfaction in full on January 24th, 1938, of mortgage in favour of Lloyds Bank, Ltd., dated March 25th, 1935, and registered April 3rd, 1935. (According to the register of mortgages, the only instrument registered April 3rd, 1935, was a charge which originally secured all moneys due to bank not exceeding £1,400.)

F. J. Watson & Son, Ltd.—Debenture dated January 18th, 1938, to secure £2,410 and all moneys and liabilities due or to become due or incurred by the company to Steel & Co., Ltd., Paley Street, Sunderland. Property charged: Lease dated November 26th, 1934, and the premises comprised therein, and the company's undertaking and other property, present and future, including uncalled capital.

Neon Luminous Tubes (Lund Signs), Ltd.—Capital, £2,000 in 1,000 preference and 1,000 ordinary shares of £1. Return dated December 31st, 1937. 692 preference and 1,000 ordinary shares taken up. £692 paid on the preference shares. £1,000 considered as paid on the ordinary shares. Mortgages and charges, nil.

Barsi Light Railway Co., Ltd.—Capital, £800,000 in £29,680 preference stock, £730,320 ordinary stock and 4,000 ordinary shares of £10. Return dated October 19th, 1937. All stock taken up. £760,000 paid. Mortgages and charges, £140,000 4 per cent. debenture stock, £99,100 4 per cent. "Latur Extension" debentures and £60,000 5½ per cent. debenture stock.

Mersey Cable Works, Ltd.—Capital, £70,000 in £1 shares. Return dated November 11th, 1937. All shares taken up. £62,400 paid. £7,600 considered as paid. Mortgages and charges, nil.

Simplex Conduits, Ltd.—Capital, £100,000 in £1 shares. Return dated November 8th, 1937. 90,000 shares taken up. £50,000 paid. £40,000 considered as paid. Mortgages and charges, nil.

Lucas Batteries, Ltd.—Capital, £20,000 in £1 shares. Return dated January 3rd, 1938. All shares taken up. £20,000 paid. Mortgages and charges, nil.

Metalite Co., Ltd.—Capital, £100 in £1 shares. Return dated December 20th, 1937. All shares taken up. £100 paid. Mortgages and charges, nil.

Vaughan Crane Co., Ltd.—Capital, £150,000 in 50,000 preference and 100,000 ordinary shares of £1. Return dated December 15th, 1937. 16,880 preference and 53,578 ordinary shares taken up. £43,669 paid. £26,789 considered as paid. Mortgages and charges, nil.

Tubes, Ltd.—Capital, £215,000 in £1 shares. Return dated November 12th, 1937. All shares taken up. £107.584 paid (£1 on 82,859 and 10s. on 49,450 shares). £107,416 considered as paid £1 on 82,691 and 10s. on 49,450). Mortgages and charges, nil.

S. D. Mouldings, Ltd.—Satisfaction in full on November 26th, 1937, of debenture dated August 26th, 1937, and registered August 27th, 1937, securing £274. (Notice filed January 28th, 1938.)

Vaughan Martin, Ltd.—Issue on January 20th, 1938, of £500 debentures, part of a series already registered.

John Holder & Co., Ltd.—Issue on January 25th, 1938, of £1,000 debentures, part of a series already registered.

Conradty Products, Ltd.—Issue on January 26th, 1938, of £500 debentures, part of a series already registered.

Ramsdens Patents, Ltd.—Issue on January 20th, 1938, of £200 debentures, part of a series already registered.

Inventum Electrical Appliances, Ltd.—Capital, £500 in £1 shares. Return dated January 12th, 1938. 52 shares taken up. £52 paid. Mortgages and charges, nil.

D. C. Electric Co., Ltd.—Capital, £3,000 in 1,500 preference and 1,500 ordinary shares of £1. Return dated October 25th, 1937. 1,350 preference and 1,500 ordinary shares taken up. £1,250 paid. £1,600 considered as paid. Mortgages and charges at date of return, nil. Since registered, series of debentures for not more than £2,640, all issued December 17th, 1937.

Simplex Electric Co., Ltd.—Capital, £500 in £1 shares. Return dated November 9th, 1937. All shares taken up. £500 paid. Mortgages and charges, nil.

Burgess Products Co., Ltd.—Capital, £10,000 in 5,000 ordinary and 5,000 preference shares of £1 each. Return dated November 5th, 1937. 5,000 ordinary and 5,000 preference shares taken up. £10,000 paid. Mortgages and charges, nil.

W. J. Henderson & Co., Ltd.—Capital, £3,000 in £1 shares. Return dated August 31st (filed October 6th.), 1937. All shares taken up. £745 paid. £2,255 considered as paid. Mortgages and charges, £310.

City Notes

The Westinghouse Brake & Signal Co., Ltd., held its annual meeting on February 8th, when Lord Southborough (chairman),who presided, said that the improvement in the fortunes of their subsidiary companies mentioned at the last meeting had been more than maintained. The company had commenced the year with a large volume of orders and the factory had worked at maximum pressure throughout the year, but the value of orders now on their books was even greater than at this time last year. For three years they had been making extensions to their works and increasing their output, and in addition to the extensions already made they were now carrying out a programme which would result in additional 91,000 sq. ft. more floor space being made available during the present year. The work on the Polish brake contract was proceeding satisfactorily and the first deliveries in connection with the contract for the Lithuanian State Railways had been made. If normal conditions prevailed in industry there was no reason why the current financial year should not yield satisfactory results. Capt. B. H. Peter (managing director) said that 67 per cent. of the Polish contract was completed and work was ahead of time. Of their total sales 59 per cent. had been exported, and their products were sent to sixty-four different countries. Their brake business again created a record. They received last year a contract from the London Passenger Transport Board for their latest type of electro-pneumatic brake. Deliveries had commenced and would continue for two years. The same type of brake had been adopted on several other railways for their electrified sections. The L.N.E.R. and the L.M.S. were using this brake in their latest electrifications; it was also being used on the Warsaw electrification and had recently been adopted by New Zealand. The brake business for road vehicles was satisfactory, the extension of trolley-bus services having brought a lot of work. The signalling department had received large orders from the L.N.E.R., the Southern Railway, and for the extensions to the London Underground railways. The use of their rectifiers for electro-plating had grown into an important business, and last year they applied the rectifier to cinema arc projectors, and had already equipped 60 cinemas. Their staff and employés had now reached 2,800, and it was anticipated that during the current year the total would at least reach the 3,000 mark.

The Shawinigan Water & Power Co. reports gross earnings for 1937 of $14,769,142, as compared with $13,954,359 in the preceding year, and net earnings of $4,585,684 (against $3,987,893). After providing for depreciation, unamortised bond premium, discount and expenses and dividends, totalling 85 cents (against 65 cents), the year's surplus is $1,075,013 ($829,995). The surplus, subject to deduction for 1937 income tax, which is computed and payable in 1938, amounted to $2,192,290 at the end of the year, as against $1,534,714 at the close of the previous year. The company's total power output for the year established a new high record, amounting to 5,709,759,711 kWh, as compared with 5,667,116,962 kWh generated and purchased in the preceding year.

The Southern Railway Co. has announced an increase of £1,312,769 in the gross receipts for 1937, as compared with the preceding year, and of £325,964 in the net revenue. It is proposed to pay a final dividend of 3 per cent. on the preferred ordinary stock, making 5 per cent. for the year, and a dividend of 1½ per cent. for the year on the deferred ordinary stock. For the previous year a dividend of ½ per cent. was paid on the deferred stock. The balance carried forward is £226,804 (against £220,809 brought in).

British Lead Mills, Ltd., which was incorporated in January, 1937, reports a trading profit for the period to October 31st of £27,384. Depreciation receives £2,663, income tax and N.D.C. £4,702, and capital reserve, being net profits prior to incorporation, £2,077. The final dividend is 10 per cent., making 20 per cent. for the ten months (equivalent to 24 per cent. per annum), general reserve receives £2,500 and £4,191 is carried forward.

The Electrolux Corporation has declared a dividend of 40 cents per share for the quarter ending March 31st. This compares with 40 cents and an extra payment of 10 cents for the corresponding quarter of 1937. The directors state that in view of general conditions and the uncertain business outlook and despite the fact that sales last month were larger than in any previous January, it has been decided to omit an extra dividend for this quarter.

The Adelaide Electric Supply Co., Ltd., is repaying at par plus interest this year the £929,274 of 5½ per cent. redeemable consolidated debenture stock (English stock). Stockholders have the right to convert into an equal amount of 4½ per cent. consolidated debenture stock (English stock). Converting holders will receive a cash payment in English currency of £1 15s. per cent. on March 1st in addition to the half-year's interest. The closing date for conversions is February 22nd.

The Power Securities Corporation, Ltd., reports a net profit for 1937 of £104,811, as compared with £103,427 in 1936, to which is added £31,340 brought in. The ordinary dividend is maintained at 7 per cent., and £50,000 is transferred to investment reserve, leaving £16,384 to be carried forward. The investment reserve has been applied in writing down certain foreign holdings.

The Electrical & Industrial Investment Co. reports a net profit of £27,375, against £24,257 in the preceding year. The preferred ordinary dividend is maintained at 7 per cent. and the deferred ordinary dividend is 10 per cent. (against 8 per cent.), and £4,375 is placed to undivided profits account, making that account £33,675.

The London Power Co.—The application lists for the issue of £1,500,000 3½ per cent. redeemable debenture stock, 1952-72, which were opened on February 3rd, were closed the same morning, being oversubscribed.

The London Passenger Transport Board has announced that a payment of 1½ per cent. (less tax) on account of interest on London Transport "C" stock for the year ending June 30th will be made on March 28th.

The Northampton Electric Light & Power Co., Ltd., is paying a final ordinary dividend of 6 per cent., making 10 per cent. for the year.

The Rushden and District Electric Supply Co., Ltd., is paying a final dividend of 5½ per cent., making 9 per cent. for the year.

Strand Electric Holdings, Ltd., has announced an interim dividend of 4 per cent., less tax (same).

The Direct Spanish Telegraph Co. is maintaining the ordinary dividend at 6 per cent.

Stocks and Shares

TUESDAY EVENING.

THE fresh political disturbances which have arisen by reason of the German domestic crisis, coupled with the continued aggressive front shown by Japan, combine to emphasise the restraint placed upon ordinary business in the Stock Exchange and to force money more and more into purely safety-first stocks. A number of British corporations have to make arrangements this year for repayment and replacement of 6 per cent. loans issued during the war. Birmingham this week has offered five million pounds 3¼ per cent. stock at 98. An offer of 3½ per cent. stock last week by Bristol was over-subscribed nearly 60 times. For such securities as these the supply of money seems to be illimitable, to the detriment, naturally, of other stocks and shares that possess a less solid character.

The unemployment figures published on Tuesday morning confirmed the idea that trade may be falling off in certain directions. The Southern Railway, however, declared an excellent dividend on Monday in this week on its deferred stock. Cable and Wireless stocks, after a spasm of weakness, partially recovered on the hope that an early statement will be made in regard to a rearrangement of the terms under which the Combine and the Empire co-operate.

Gilt-edged Strength

Many people profess to detect the hand of the Treasury in the latest upward step in gilt-edged prices. Naturally, the authorities will be concerned to see the market firm at a time when further rearmament financing is in the offing; nevertheless, it seems unlikely that the Treasury feels called upon to put in much spade-work on its own account at a time when many other forces are acting to create the right conditions. These factors are generally well-known by now; the main force comes, of course, from the savings which are piling up in private and public hands. In seeking employment, these funds are inclined to play for safety at a time when some uncertainty clouds the outlook for trade. Money is showing a marked predilection for the security of good fixed-interest stocks. The attention paid to gilt-edged securities continues to spread from the near-dated issues, to those having more distant dates for redemption, thus indicating a lengthening of the bullish view. Results of such tendency are observable this week in the prices of the West Midlands and the London and Home Counties Joint Electricity Authorities' stocks. The former's 5 per cent. issue, dated 1948-68, is 3 points up at 115, while the latter's 4½ per cent. stock of 1955-75, at 112, is 2 points to the good. Among Central Electricity Board stocks, the 4½ per cents. of 1951-73 have gained a point to 111.

New London Power Debentures

As was to be expected, the London Power Company's issue of a million and a half 3½ per cent. debenture stock, dated 1952-72, proved much to the taste of investment's present appetite. The issue was heavily over-subscribed, applicants receiving only about one-seventh of their wants. Active dealings in the stock are taking place on the basis of ⅜ to ½ premium over the prospectus price of 99. The running yield of a shade over 3½ per cent., being only a shilling or so better than the return offered by British Government securities, reflects the gilt-edged character of the debentures. Allowing for redemption, the yield is, of course, also about £3 11s. 9d. p.c. The issue brings a measure of relief to the famine which exists in the markets for first-class industrial debenture stocks. Very few lines of any size are on offer in the electricity supply department. Among the few is another London Power issue—the 4 per cent. of 1952-73—which can be bought at 106½, to yield 3¾ per cent., and Edmundsons' 3¼ per cent. debenture, at 92, which pays £3 11s. per cent.

Electricity Supply and Equipment

Delay in the presentation of the Electricity Bill to Parliament has robbed the market of immediate interest, but has in no way ruffled equanimity. Several quotations have made headway during the past week or two, and there is no disposition for prices to yield any part of the advance. Clyde Valleys are 1s. higher, at 41s. Electrical equipment shares are less steady, with several of the leaders half a crown or so lower on the week. Losses of 2s. 6d. are shown by Crompton Parkinsons, at 25s., Lancashire Dynamos, at 3 7/8, and Ericssons, at 1 1/8. Associated Electricals, at 41s. 6d., have fallen 1s. 6d., and General Electrics, at 73s., lost twice as much.

English Electric Coming Report

The English Electric Company's report for 1937 is due for publication in the middle of this month. At the end of last year profits had recovered to the point where it was possible to pay off arrears of preference dividend, with a little to spare. But for that necessity the available earnings would have been equivalent in a normal year to about 12½ per cent. on the ordinary capital. Anticipation looks for another sizeable increase in the 1937 profits; the declaration of a long-awaited ordinary dividend is generally taken for granted. Bearing in mind, however, the effect on the balance sheet of a series of lean years, few people expect the dividend to represent anything like a liberal distribution of profits. A payment of about 7½ per cent. is regarded as likely. At that rate the yield at to-day's price of 29s. 6d. for the shares would be a shade over 5 per cent. on the money.

Buenos Ayres Transport

Excitement and rising prices preceded the Argentine Government's decree for co-ordination of Buenos Ayres transport services. Following the announcement and, later, the rough details of the scheme, prices of the affected stocks shed part of their recent advance. Anglo-Argentine Tramway issues remain the centre of activity. The first preference, at 8s. 3d., lost all but 9d. of an earlier rise to 10s. The 5 per cent. debenture rose from 20 to 30 before relapsing to 21. The "fours" are 39, after having touched 46, and the 4½ per cent., at 29, are 6 points below the best. Another active stock was Buenos Ayres Town and Dock Tramway ordinary, which rose at one time to 10s. Although a good deal is now known as to the capital and scope of the proposed consortium, and of the amount of stock to be allocated to the separate companies, the market is chary about taking too decided a view of the outlook for individual stocks under the new conditions. Generally speaking, however, expectation can be said to be satisfied with the groundwork of the scheme.

Preference Shares

The case of Oxford Electric preference shareholders has attracted sufficient notice to cause a stir of uneasiness among holders of kindred shares. It will be remembered that negotiations have been in progress for the purchase of the Oxford undertaking. In the event of a voluntary liquidation, preference shareholders face the prospect of receiving the nominal value of 20s. per share, plus accrued interest, for shares which they may have purchased at 26s. or so. Since amalgamation is evidently going to loom large in the coming Electricity Bill, it is natural that the outcome of the Oxford negotiations should be awaited with some anxiety. The position of proprietors in the larger electricity supply companies—such as those quoted in our list on this page—was discussed here last week. The practical view may be repeated that these companies of magnitude will probably do such absorbing as may be called for in the process of amalgamation: in which event there would be little likelihood of the status of their preference shares being called in question. Even in the case of smaller companies which may be earmarked for absorption it is difficult to imagine a wholesale roughriding over the claims of people who have paid a premium for preference shares in a successfully going concern. These considerations are sound enough to have satisfied the majority of preference shareholders as to their security. Nevertheless, some nervous selling has been provoked, with a resultant and fairly general marking down of prices in the shares concerned.

American "Tel." and "Tel."

The brake applied by American affairs to markets in this country remains hard down. While business activity in the United States continues to flag, President Roosevelt sticks to his New Deal guns in the face of growing pressure from business interests. Stock markets had some more bad moments last week, but have since recovered from the worst. American Telephone and Telegraph stock, with a drop of 8 points to 134½, is the weakest spot in the list. The collapse is apparently due to nervousness over the coming Federal Communications Committee's report, which, it is feared, may recommend a reduction in telephone rates and a tightening up of regulations generally. Vague New York rumours hint at the possibility of the company being called upon to provide its millions of subscribers with new installations. A good deal of the stock which is quoted in the daily "official" Stock Exchange list is assumed to be held in this country. Other transatlantic communication stocks are on the flat side, with Western Unions no better than 23 and International "Tel. and Tel." at 6⅜.

Share List of Electrical Companies

	Dividend. Nom. Previous.	Dividend. Nom. Last.	Price Feb. 8.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.					
Bournemouth and Poole	1	15	67/6	—	4 9 0
City of London	1	7½	34/-	—	4 8 3
Clyde Valley	1	7	41/-	+1/-	3 18 1
County of London	1	10½	51/-	+6d.	4 2 4
Edmundson's 7% Pref.	1	7	32 6	−6d.	4 6 2
Do. Ord.	1	8	38/-	—	4 14 9
Elec. Dis. Yorkshire	1	9	42/-	—	4 5 10
Elec. Fin. and Securities	1	12½	51/3	−1/6	4 17 6
Elec. Supply Corporation	1	11	52/6	+	4 11 5
Lancs Light and Power	1	7½	35/-	—	4 5 9
Lond. Assoc. Electric	1	—	32/-	—	4 7 6
London Electric	1	8	35/6	—	3 19 0
London Power Deb. Red.	Stock	5	108	—	4 12 7
Metropolitan	1	10	46/-	—	4 7 9
Midland Counties	1	7½	37/6	—	4 5 0
Mid. Elec. Power	1	8	2 1/8	—	4 7 4
North Eastern Electric Ordinary	1	6	32/-	—	4 7 6
Do. 7% Pref.	1	7	33/-	−1/-	4 4 10
Northampton	1	10	47/6	—	4 4 3
Notting Hill 6% Pref.	10	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	48/9	+6d.	4 2 9
Do. do. 6% Pref.	1	6	30/-	—	4 0 0
Scottish Power	1	8	37/6	—	4 5 4
South London	1	7	32/6	—	4 6 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	21/6	—	6 19 6
Yorkshire Elec.	1	8	40/-xd.	—	4 0 0
PUBLIC BOARDS					
Central Electricity, 1950–70	Stock	5	112xd.	—	4 9 3
Do. 1955–75	„	5	117	+⅛	4 5 6
Do. 1951–73	„	4½	111	+1	4 1 1
Do. 1963–93	„	—	99	—	3 10 8
London Elec. Trans Gtd.	„	—	91	—	2 15 0
London & Home Counties, 1955–75	„	4½	112	+2	4 0 4
London Passenger Transport, A.	„	—	118½	—	3 16 3
Do. do. B.	„	—	5	121½	— 4 2 4
Do. do. C.	„	4	4½	81	+⅛ 5 5 0
West Midlands Joint Elec. 1948–68	„	—	5	115	+3 4 7 0
TELEGRAPH AND TELEPHONE.					
American Tel. & Tel.	$160	9	9	134½	−8 6 13 10
Anglo-Am. Tel. Pref.	Stock	6	6	113½xd.	— 5 6 2
Do. Def.	„	1½	1½	27xd.	— 5 11 3
Cable & Wireless 5½% Pref.	„	4½	5½	102⅛	−⅛ 5 6 10
Do. Ord.	„	—	—	63	−1 —
Do. Income	„	—	—	101½	— 3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	14⅜	−⅛ 3 14 9
Do. do. Pref.	10	6	6	13⅜	— 4 6 6
Great Northern Tel.	10	20	20	39½	— 5 1 3
Marconi-Marine	1	10	7½	29/6	— 5 1 8
Oriental Telephone Ord.	1	12*	12*	2⅞	— 4 3 6
HOME AND FOREIGN TRAMS, ETC.					
Anglo-Arg. Trams First Pref.	5	Nil	Nil	8/3	+9d. —
Do. do. 2nd Pref.	5	Nil	Nil	3/9	−9d. —
Do. do. 5% Deb.	Stock	Nil	Nil	22½	+2½ —
British Electric Traction Def. Ord.	„	5	5	987	−25 —
Do. do. Pref. Ord.	„	8	8	165	— 4 17 0
Brazil Traction	$100	70 cts.	$1	10⅜	−⅛ —
Brit. Columbia Elec. Rly. Pfc.	Stock	5	5	103½	— 4 14 9
Mexican Light Common	$100	Nil	Nil	2	— —
Do. 1st Bonds	$500	5	5	35	— —
Victoria Falls Ord.	1	20	12	3	— 4 0 0
West Riding	1	6½	10	2	— 5 0 0
MANUFACTURING COMPANIES.					
Aron Electricity Ord.	1	15	15	2	— 7 10 0
Assoc. Elec. Ord.	1	8	10	41/6	−1/6 4 16 5
Do. Pref.	1	8	8	38/-	— 4 4 6
Babcock & Wilcox	1	8	10	43/3	— 4 12 6
British Aluminium Ord.	1	7½	10	46/3	−⅛ 4 6 6
British Insulated Ord.	Stock	20	20	4 1/8	−⅛ 4 5 3
Brush Ord.	Stock	Nil	Nil	20½	— —
Callender's	1	15	15	4 7/8	— 3 9 1
Do. 6½% Pref.	1	6½	6½	31/3	— 4 2 4
Crompton Parkinson Ord.	5/-	12½	12½	25/-	−⅛ —
Do. 8% Pref.	1	8	8	37/6	— 4 5 4
Electric Construction	1	7	10	1⅜	— 5 14 4
Enfield Cable Ord.	1	25	25	5½	— 4 17 8
English Electric	1	Nil	Nil	29/6	−6d. —
Do. do. Pref.	1	6½	6½	25/6	— 5 2 0
Ericsson Tel.	5/-	20	25*	1 1/8	−⅛ 3 4 7
Ever Ready	5/-	35	45	26/-	— 8 13 2
Ferranti Pref.	1	7	7	27/6	— 5 1 10
G.E.C. Pref.	1	6½	6½	32/6	— 4 0 0
Do. Ord.	1	15	17½	73/-	−3/- 4 16 0
Henley's	5/-	30	15	19/6	— 3 17 0
Do. 4½% Pref.	1	4½	4½	1½xd.	— 4 0 0
India-Rubber Pref.	1	5½	5½	22/-	— 5 0 0
Johnson & Phillips	1	½	10	40/9	— 4 18 0
Lancashire Dynamo	1	10	20	2 7/8	−⅛ 5 16 4
Siemens Ord.	1	6	7½	28/9	— 5 4 4
Telegraph Construction	£1	Nil	7½	2 7/8	— 3 1 6

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1936

7298. "Electrical musical instruments." E. Werndl. April 9th, 1936. (478142.)

13539. "Electrical connectors produced from strip blanks." Carr Fastener Co., Ltd., and J. H. Kohler. May 13th, 1936. (478189.)

16154. "Arc-quenching devices." Siemens-Schuckertwerke Akt.-Ges. June 14th, 1935. (478122.)

16453. "Electric regulators." English Electric Co., Ltd., and J. E. Calverley. June 12th, 1936. (478124.)

16526. "Thermionic-valve circuits." R. I. Kinross and W. J. Brown. June 13th, 1936. (478194.)

16579. "Electric condensers." Hydrawerk Akt.-Ges. June 24th, 1935. (478195.)

18920. "Incandescent body for electric incandescent lamps." B. Duchnitz. July 8th, 1935. (478197.)

18993. "Electric cables." Pirelli-General Cable Works, Ltd., and G. Martinez. July 9th, 1936. (477996.)

19123. "Electric distribution systems." J. M. Hollander. July 10th, 1936. (Cognate application, 23707/36.) (478131.)

19136. "Cathode-ray tubes." Westinghouse Electric and Manufacturing Co. August 24th, 1935. (478200.)

19154. "Electrically heated vapour-producing devices, more particularly for respiratory treatment. J. Robinson. July 20th, 1935. (Cognate applications, 19155/36, 19156/36, 19157/36, 19158/36 and 19159/36.) (478244.)

19199. "Electric incandescent light source, more particularly for television transmitters." Radioakt.-Ges. D. S. Lowe. July 12th, 1935. (478133.)

19234. "Apparatus for automatic compression and expansion of volume range in electro-acoustic systems." E. L. E. Pawley. July 10th, 1936. (478137.)

19295. "D.C. voltage changers for feeding television receivers." E. Michaelis. July 11th, 1936. (478300.)

19381. "Fluorescent screens." Telefunken Ges. für Drahtlose Telegraphie. July 11th, 1935. (478302.)

19422. "Electric-discharge devices." British Thomson-Houston Co., Ltd., and L. J. Davies. July 13th, 1936. (478208.)

19455. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd., and G. B. Banks. July 13th, 1936. (478001.)

19457. "Radio and like high-frequency transmission line arrangements." Marconi's Wireless Telegraph Co., Ltd. July 13th, 1935. (Cognate application, 19458/36.) (478211.)

19517. "Cycle dynamos." J. Lucas, Ltd., and A. Huyton. July 14th, 1936. (478251.)

19538. "Generation and transmission of high-frequency currents in a.c. circuits. E. Hallowell and Northern Utilities Trust, Ltd. July 14th, 1936. (478314.)

19557. "Lamps for use in mines and other places." Oldham and Sons and H. Holt, jnr. July 14th, 1936. (478068.)

19655. "Methods of and means for discharging electricity from materials." C. R. A. Chadfield. July 15th, 1936. (478263.)

19739. "Magnetic deflecting systems for cathode-ray tubes." Fernseh Akt.-Ges. July 16th, 1935. (478260.)

19744. "Lighting fittings." H. Biggleston (trading as Electric Street Lighting Apparatus Co.) and D. Wilman. July 16th, 1936. (478261.)

19755. "Electron multipliers." General Electric Co., Ltd., W. H. Aldous, D. W. Fry and C. H. Simms. July 16th, 1936. (478262.)

19826. "Electro-magnetic coils." E. Ruska and Fernseh Akt.-Ges. July 17th, 1936. (478266.)

19840. "Electrical instruments for signalling on railways." Tyer and Co., Ltd., and V. S. King. July 17th, 1936. (478267.)

19886. "Thermionic-valve circuits." Standard Telephones and Cables, Ltd., and W. T. Gibson. July 17th, 1936. (478272.)

19922. "Electric storage batteries and methods of manufacture thereof." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). July 17th, 1936. (478274.)

19931. "Electrolytic production of magnesium." Magnesium Metal and Alloys, Ltd. July 20th, 1935. (478276.)

19981. "Automatic control of the speed of electric motors." M. Pitt. July 18th, 1936. (478214.)

20305. "Electrode arrangements for electric-discharge gaps." General Electric Co., Ltd., and W. G. Thompson. July 22nd, 1936. (Cognate application 21981/36.) (478283.)

21404. "Trolley mountings for tramway cars, trolley omnibuses and like vehicles." Metropolitan-Cammell Carriage & Wagon Co., Ltd., and F. H. Rayer. August 4th, 1936. (478074.)

24924. "Electric couplings." Alklum Storage Batteries, Ltd., and C. J. Berg. September 12th, 1936. (478013.)

25145. "Electric incandescent lamps." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). September 15th, 1936. (478014.)

26413. "Electrical insulating materials." Callender's Cable & Construction Co., Ltd., and E. Tunnicliff. September 29th, 1936. (478222.)

26908. "Cathode-ray tubes." Ferranti, Ltd., and E. G. O. Anderson. October 5th, 1936. (478083.)

28866. "Sealing of electric conductors through quartz." General Electric Co., Ltd., and K. G. Schnetzler. October 23rd, 1936. (478018.)

29081. "Dials for wireless sets." Radiowerk Horny Akt.-Ges. February 1st, 1936. (478148.)

29181. "Magneto-electric machines." British Thomson-Houston Co., Ltd., and L. Griffiths. October 27th, 1936. (478149.)

29938. "Cathode-ray tubes." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. November 14th, 1935. (478151.)

31066. "Circuits including secondary emission electron multipliers." General Electric Co., Ltd., and D. C. Espley. November 13th, 1936. (478153.)

32275. "Thermionic cathodes for high-pressure metal-vapour discharge devices." General Electric Co., Ltd., and V. J. Francis. November 25th, 1936. (478024.)

1937

1863. "Signal-selecting systems for use in carrier signalling." Hazeltine Corporation. February 12th, 1936. (478226.)

2893. "Metering apparatus." British Thomson-Houston Co., Ltd. January 31st, 1936. (478091.)

3072. "Electrical apparatus." British Thomson-Houston Co., Ltd. February 3rd, 1936. (478157.)

5798. "Enclosed dynamo-electric machine." Soc. d'Applications Industrielles (Safi). March 3rd, 1936. (478040.)

5850. "Electron-amplifier discharge devices." Telefunken Ges für Drahtlose Telegraphie. March 4th, 1936. (478095.)

8212. "Air insulated electric cables." Siemens & Halske Akt.-Ges. March 23rd, 1936. (478097.)

8648. "Electrical resistance elements." Weston Electrical Instrument Corporation. April 20th, 1936. (478161.)

10945. "Air-insulated cables." Siemens & Halske Akt.-Ges. October 31st, 1936. (478100).

10956. "Dial switches more particularly for telephone systems." Telephon Apparat Fabrik E. Zwietusch & Co. Ges. November 23rd, 1936. (478229.)

11433. "Electron-discharge tube arrangements." Telefunken Ges für Drahtlose Telegraphie. April 30th, 1936. (478166.)

12978. "Insulated electric conductors." British Thomson-Houston Co., Ltd. May 6th, 1936. (478106.)

13055. "Air-space insulated concentric high-frequency electric cables." Felten & Guilleaume Carlswerke Akt.-Ges. June 6th, 1936. (478107.)

13080. "Electric insulator for lines transmitting electrical energy." Quartz & Silice. May 15th, 1936. (478170.)

13693. "X-ray contrast media." Schering-Kahlbaum Akt.-Ges. May 15th, 1936. (478108.)

15310. "Electrical relays." Igranic Electrical Co., Ltd. June 18th, 1936. (478110.)

15783. "Spark-plugs." C. A. Xardell. June 7th, 1937. (478175.)

17235. "Electric condensers." British Electrolytic Condenser Co., Ltd., D. J. P. Philips and G. C. Gaut. June 21st, 1937. (478177.)

20622. "Electric soldering device." R. Konig and O. Albietz. August 6th, 1936. (478183.)

32043. "Cathode-ray tubes." V. Zeitline, A. Zeitline and V. Kliatchko. May 9th, 1935. (Divided out of 476865.) (478121.)

33110. "Light-sensitive electron-discharge tubes." V. Zeitline, A. Zeitline, and V. Kliatchko. June 13th, 1935. (Divided out of 16580/36.) (478238.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from February 2nd:—

Mena. No. 579255. Class 6. Vacuum cleaning machines, electric fans and electrically or mechanically operated sirens, &c.—Pail Linke & Co., Tempelhof, Berlin, Germany (British representatives: Cruikshank and Fairweather, 65-66, Chancery Lane, W.C.2).

Ever Ready. No. 579760. Class 6. Electrically operated shaving machines and parts thereof.—Ever Ready Razor Products, Ltd., Ever Ready Corner, The Hyde, Hendon, N.W.9.

Ironex. No. 580512. Class 13. Electrodes of ordinary metal.—Murex Welding Processes, Ltd., Ferry Lane Works, Forest Road, Walthamstow, E.17.

Census of Road Vehicles

A Ministry of Transport return published recently ("Road Vehicles—Great Britain, No. 109A," Stationery Office, 1s. net) contains (a) a census of mechanically propelled vehicles for which licences were current at any time during the quarter ended September 30th, 1937, and (b) the number of vehicles of different types registered for the first time during the twelve months to September 30th. The following tables show the number of electrically propelled vehicles of different types in the two sections. Under (a) the total number of hackney vehicles in 1937 is given as 95,423, of which 12.3 per cent. were electrically propelled. Electric goods vehicles increased in number by 30 per cent., but represented only 0.7 per cent. of the total (478,922).

A.—Licences Current During Quarter Ended September 30th.

	1936.	1937.
Tramcars	10,260	9,657
Trolley-buses	1,588	2,125
Goods vehicles:		
Agricultural vans and lorries	1	16
Showmen's	6	3
Municipal watering and cleansing	15	7
Other	2,585	3,313
Cars taxed on h.p.	14	13
Total electrically propelled vehicles	14,469	15,134

B.—Vehicles Licensed for the First Time in the Year Ended September 30th.

	1936.	1937.
Trolley-buses	418	550
Goods vehicles:		
Agricultural vans and lorries	1	1
Municipal watering and cleansing	1	1
Other	783	884
Cars taxed on h.p.	3	4
Total electrically propelled vehicles	1,206	1,440

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alnwick.—Houses (24), Warkworth; R.D.C. surveyor. School (£19,387); J. G. Green & Sons, Ltd.

Barnsley.—Cinema, New Street; Odeon Theatres, Ltd. Maternity home; borough engineer.

Batley.—Works for Walker & Smith, Ltd., Bradford Road.

Bedworth.—Houses (42), Blackhorse estate; surveyor, Council offices.

Birkenhead.—Estate development, Gayton Lane; Clegg Estate Development Co.

Birmingham.—Factory and offices, Cheston Road, for Timkin, Ltd., Aston; Maddocks & Walford, builders, Tyburn Road, Birmingham.

Blackburn.—School (£50,983); W. Livesey & Sons, Ltd., contractors, Hall Street.

Bolton.—Houses (12), Stoneyhurst Avenue; F. & H. Douglas. School, Pikes Lane (£8,450); A. E. Dalzell. Extensions to works, Viking Street; Bolton & Hayes, Ltd.

Bridgnorth.—Houses (26), Victoria Road site; borough surveyor, Municipal Offices.

Bristol.—School, Doncaster Road (£15,637); T. Weeks & Sons, Ltd. Two schools, Whitehall and Muller Roads, for the Corporation Education Committee. Twelve shops and houses, Filwood Broadway, and extensions to Barrow Hospital (£18,243); city engineer.

Bury.—School, Elton, for the E.C.

Cardiff.—Extensions to West National School of Medicine (£30,000); C. E. Elcock, architect, 60, Strand, London, W.C.2.

Carlisle.—Extensions to Cumberland Royal Infirmary (£200,000); S. W. B. Jack, architect, 35, Warwick Road.

Cheltenham.—Cinema, St. George's Road, for Associated British Cinemas, Ltd.; L. C. Norton, architect, 45, Albemarle Street, London, W.1.

Chester.—School, Helsby, for the County E.C.; F. A. Browne, county architect, Chester.

Chesterfield.—Houses, Bacons Lane; Rollinson & Son, architects. Houses (32), Brookbank estate; F. Longden & Son. Houses, Hasland; W. A. Derbyshire, architect. Stores, Hugh Street; Marks & Spencer, Ltd.

Chester-le-Street.—Houses, Ouston; R.D.C. surveyor.

Coventry.—Factory near Burnaby Road, for the Coventry Felt Co., Ltd., Wellington Street; Garlicks, Ltd., contractors, Far Gosford Street. Shops, Trinity Street and Corporation Street; E. H. Ford, city engineer.

Dartford.—Extensions to Joyce Green Hospital (£96,982); Allen Fairhead & Sons, Ltd.

Derbyshire.—Extensions to Belper Institution (£51,617), for the C.C.; W. Ford & Sons (Contractors), Ltd., Victoria Street, Derby.

Dewsbury.—Houses (142), Canterbury Road site; borough surveyor.

Durham.—Schools, South Hetton, Castletown, Trimdon, Fishburn and Wheatley Hill, for the C.C.; county architect, 34, Old Elvet, Durham.

Eccles.—Houses (13), Higher Croft; E. Whitehead. Works and offices, Monton Fields Road; Hill & Hiley, Ltd.

Edinburgh.—Market buildings (£22,000) for Corporation; city architect.

Essington (WOLVERHAMPTON).—Houses (36), Sneyd Lane; A. Smith.

Flaxton (YORKSHIRE).—Houses (20), Strensall, Haxby and Wigginton; L. Parker, surveyor, 10, Museum Street.

Fort William.—Houses (150), for British Aluminium Co., Ltd.; A. Hall & Sons, contractors, Aberdeen.

Friern Barnet.—Houses (25), Oakleigh Gardens; L. T. Swanne & Co.

Gateshead-on-Tyne.—School, Lobley Hill, for the E.C.; borough engineer.

Glasgow.—Cinema, Paisley Road; D. M. Kidd. Police quarters, Millbrae Street (£8,000); city engineer and trade contractors. Portable ice rink, Kelvin Hall, for Corporation; city architect. Shops, Ashfield Street and Bardowie Street; Felix M'Court. Works extensions, South Street; Yarrow & Co., Ltd.

Guildford.—Houses (60), Grange Farm, near Shawfields Road; R.D.C. surveyor. Additions to Warren Road hospital (£15,603); Grace & Marsh.

Halifax.—Houses and flats (1,100) and extensions to Heath Grammar school (£12,800); borough surveyor.

Hastings.—Houses (192), Rock estate; borough engineer.

Hendon.—Extensions to factory, for Everett, Edgcumbe & Co., Ltd., Colindeep Lane.

Heston.—Baths (£85,000); borough engineer.

Ireland (Co. MAYO).—Cinema, Spencer Street, New Castlebar, for G. Bourke, Castlebar.

Kidderminster.—Houses (12), Vicarage Farm estate; Durham Moon Estates, Ltd. Extensions to works, Mill Street; Carpet Trades, Ltd.

Kilmarnock.—Houses (50), Bonnyton; burgh surveyor.

King's Lynn.—Houses (56), Gaywood Hall estate; D. H. Loukes, architect, 64, St. Andrews Street, Cambridge.

Lanarkshire.—School, Buchanan Street, Baillieston, for the County Council; architect, County Offices, Hamilton.

Lancashire.—Extensions (£13,073), to the Bacup and Rawtenstall Grammar school for the County E.C.; John Turner & Son (Preston), Ltd., contractors. William Henry Street, Preston. Extensions (£13,368) to the Lancaster Girls' Grammar school, for the E.C.; R. L. Dilworth, contractors, Damside Street, Lancaster.

Leeds.—Flats (80), Camp field area, and ice rink; city architect. News cinema, Moortown; W. Hobson

Leek.—School (£28,000); S. Jolley, builders, Milton, Stoke-on-Trent.

Leicestershire.—Gymnasium and swimming pool, Loughborough College (£43,500), for the E.C.; W. Moss & Sons, Ltd., contractors, Queen's Road, Loughborough.

Leytonstone.—Cinema, High Road; A. Mather, architect, Leicester Square Chambers, W.C.2.

Liverpool.—Houses (26), Parkside Drive; Irving & Mosscrop, architects, 6, Stanley Street.

Liversedge.—Houses (32), Fountain Street; C. Brooke. Houses (44), Hightown Road; Crossland & Crossland, builders, Westcliff Road, Cleckheaton.

London.—(HACKNEY).—Flats, Gascoyne Street (£137,500); L.C.C. architect, County Hall, Westminster Bridge, S.E.1. (SOUTHWARK).—Houses, 177-197, Trafalgar Street; Lansdown & Brown. Printing works, Surrey Row; Eley & Allen. (STEPNEY).—Flats, Malay Street (£70,850); L.C.C. architect, County Hall, Westminster Bridge, S.E.1.

Longbenton.—School (£26,500); Alex Anderson, Ltd.

Luton.—Extensions, &c., to Beech Hill school (£28,692), for the E.C.; H. C. Janes, Ltd., contractors, Luton.

Manchester.—Enlargement of St. Mary's Road school; J. E. Stephenson.

North Cotswold.—Houses (76); R.D.C. surveyor, Council Offices, Moreton-in-Marsh, Gloucestershire.

Northumberland.—Extensions to St. Andrews Hospital, Morpeth (£7,500), for the County Council.

Nottinghamshire.—Mental colony, Balderston (£195,300), for the County Council; E. Coleman.

Oldbury.—Houses (36), Birmingham Road; C. J. McWhirter. Houses (30), for aged persons, Moat Farm estate; surveyor, Council Offices. Extensions to Broadwell works; Simplex Electric Co., Ltd.

Orston.—School (£2,299); G. W. Marston & Son.

Plymouth.—Houses (60), Moor Lane; Taylor Woodrow Estates, Ltd. Houses (19), Pemros Road; W. Williams. College buildings, Manadon, for the Royal Naval Engineering College.

Raunds.—Council Offices (£2,500), Marshall Road; G. Whittam, U.D.C. surveyor, Council Offices, Raunds, Wellingborough.

Rowley Regis.—Houses (102), Tividale estate, for John Mackay & Croxford, Edmund Street, Birmingham.

Rugby.—Houses (24); E. Hopkins & Co., Millfields Avenue and Kingsley Avenue. Houses (70), Parkfield Road estate, Newbold; Eadie & Co., contractors, Wolverhampton.

St. Helens.—Reconstruction of St. Helens Hippodrome, Corporation Street, as cinema; Gornall & Wainwright, architects, Hardshaw Street.

Scorton (YORKSHIRE).—Hotel, Scotch Corner, for Aitchison, Edinburgh, and Summers and McGowan, Glasgow; Marshall Tweedy and Bourne, architects, Grainger Offices, Newcastle-on-Tyne.

Shropshire.—Extensions and alterations to County Offices and Shirehall, Shrewsbury (£52,757), for the County Council; E. Crowder, Ltd., contractors, South Road, Handsworth, Birmingham.

South Shields.—School, Simonside; education architect, Town Hall.

Staffordshire.—School (£25,899), Brierley Hill, for the County E.C.; A. Crump & Sons, Ltd., Dudley.

Staines.—Extensions to factory, for The Lino Manufacturing Co., Ltd.

Stourbridge.—Houses (112), Hungary Hill; W. J. Tolley, builder, Hagley Road, Hasbury.

Stretford.—Extensions to works, Chester Road; Manchester Cellulose Finishes, Ltd.

Sunderland.—Houses, Castletown, and East Herrington; R.D.C. surveyor. Factory, Pallion Trading estate, for Saturn Oxygen, Ltd.; W. & T. R. Milburn, architects, 17, Fawcett Street.

Surrey.—School, London Road, Mitcham (£25,234), for the County E.C.

Sutherland.—School, Golspie, with electrical work, for the C.C.; E. W. Brannen, architect, Public Health Office, Dornoch.

Tewkesbury.—Houses (38), Oldbury Gardens and Swilgate Road (£13,620); Wheeler & Mansell, Ltd., contractors, Evesham.

Tyldesley.—Houses (60), Mossley Common estate; R. & W. Gregson, contractors, Milk Street. Houses, Princess Avenue, Astley; G. F. Jones, U.D.C. surveyor.

Tynemouth.—Factory, Great Northern Knitwear Co., Ltd.; Hays & Gray, architects, Camden Street, North Shields.

Uxbridge.—Extensions to works for the Steel Barrel Co., Ltd., High Street.

Wakefield.—Houses (26), Gill Syke estate; Elvey & Steele.

Walsall.—Factory, Brockhurst Crescent, for L. G. Firth; Cheshire, Gibson & Co., architects, 21, Waterloo Street, Birmingham.

Waltham Abbey.—Houses (28), Quinton Hill; U.D.C. surveyor.

Watford.—Extensions to Leavesden Hospital (£10,925); L.C.C. architect, County Hall, Westminster Bridge, S.E.1.

Whitley Bay.—Houses (80), Hartley; A. J. Rousell, U.D.C. surveyor.

Whitworth.—Houses (32), Underbank; U.D.C. surveyor.

Wimbledon.—Extensions to Ursuline Convent School (£9,200); trustees.

Windlesham.—School (£11, 477); Crosby & Co., Ltd.

Winlaton-on-Tyne.—Hospital (£83,000), Norman's Riding, for Joint Hospital Board; Shield Bros., contractors, Back Park Terrace, Swalwell, Durham.

Worthing.—Printing works, Prospect Place; E. J. Hey. Twelve shops and flats, Offington Lane, for Liverpool Gardens, Ltd.; Jordan & Cook, architects.

Yeadon.—Aerodrome (£39,400); Bradford and Leeds Corporations.

Yorkshire.—School, Glasburn, for the West Riding County Council.